Truscon Steel Co.

Gray Des. Div. 5/17/49 — Gift

TRUSCON STEEL DOORS

DESIGN

FOR HANGARS AND INDUSTRIAL BUILDINGS

RETURN TO
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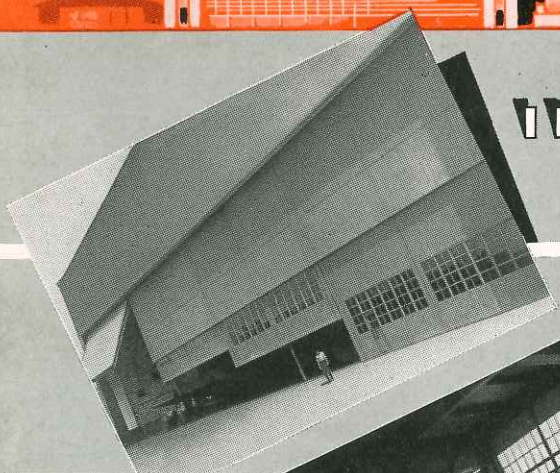
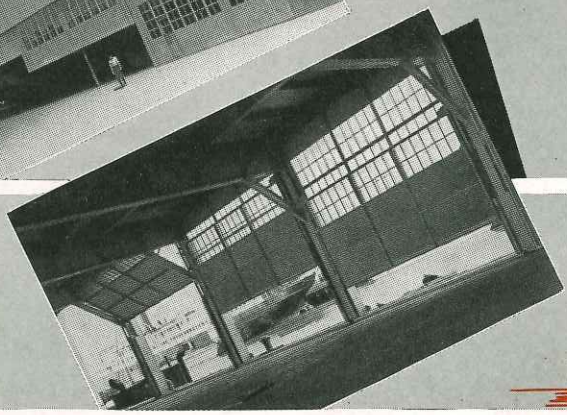
DESIGN DIVISION





1947 EDITION

21 YEARS EXPERIENCE IN STEEL DOOR FABRICATION

Truscon Steel Doors are the product of years of manufacturing experience and research combined with the best engineering skill, workmanship and materials. Their design, manufacture and erection is a highly developed art and must be undertaken by experienced men, in order to result in completely satisfactory installations.

The success of a steel door installation depends to a great extent on the experience and good judgment of the manufacturer's field organization. Truscon's field crews are comprised of specially trained men who "know how", through years of experience with many installations, to do just the right things to make the job a success.

During the past 21 years, Truscon has developed a number of different types of steel doors, each designed to fill a specific need of the aviation and industrial field and each tested and proved by numerous installations.

In addition to Steel Doors, Truscon manufactures a complete line of steel building products including Steel Windows and Mechanical Operators, Metal Lath, Open Truss and Clerespan Steel Joists, Steeldeck Roofs and Concrete Reinforcing Products. See Truscon's catalogs in sections 16a/25 and 3d/9 for complete descriptions of these products.

The extremely wide selection of products which are available, makes it possible for the Architect to avail himself of the assistance of Truscon Engineers with the full knowledge that his most exacting requirements can be met — with standard, economical products.

TABLE OF CONTENTS

Straight Slide Hangar Doors:
- General Description 3
- Specifications 4
- Standard Leaves 5
- Construction Details . . . . . 6 – 10

Tail Doors:
- General Description 3
- Specifications 12
- Construction Details 10, 11

Curved Track Hangar Doors:
- General Description 13
- Construction Details 14, 15

Unbraced Canopy Hangar Doors:
- General Description 16
- Specifications 16
- Construction Details 17

Braced Canopy Hangar Doors:
- General Description 18
- Specifications 18
- Construction Details 19

Vertical Lift Canopy Hangar Doors:
- General Description 20
- Specifications 21
- Construction Details 22, 23

Two-Section Vertical Lift Doors:
- General Description 24
- Specifications 24, 25
- Construction Details 24, 25
- Anchor Bolt Details 28

Two-Section Turnover Steel Doors:
- General Description 26
- Specifications 26, 27
- Construction Details 26, 27
- Anchor Bolt Details 28

Crane Doors:
- General Description 29

Industrial Canopy Steel Doors:
- General Description 30
- Specifications 30
- Construction Details 31, 32, 33

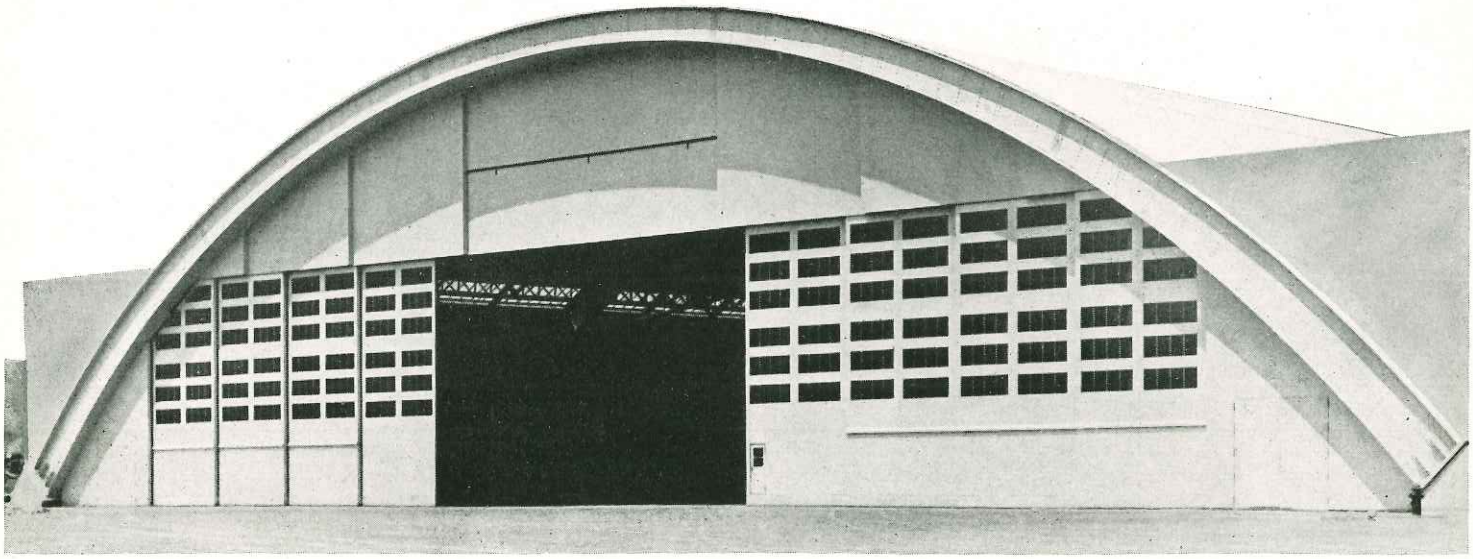
Pier Doors:
- Turnover Type 34
- Lift-Swing Type 35

Sales Offices 36

For information on Industrial Swing and Slide Steel Doors, and Accordion Steel Doors see Truscon's Steel Window and Door Catalog in Section 16a/25.

TRUSCON STEEL COMPANY, YOUNGSTOWN 1, OHIO

SUBSIDIARY OF REPUBLIC STEEL CORPORATION



Truscon Electrically Operated Straight Slide Steel Hangar Doors and Electrically Operated Vertical Lift Tail Doors.
Washington National Airport, Washington, D. C.

TRUSCON STRAIGHT SLIDE STEEL HANGAR DOORS

Manually operated Straight Slide Steel Hangar Doors are the simplest and least expensive of all types. They are used primarily in semi-tropical and tropical climates where heating of hangars is not a consideration and where doors can be left open most of the time. They are also satisfactory in unheated storage hangars, and in colder climates where it is not necessary to open and close them often. They are limited in width and height of leaf only by the weight which can be easily operated by hand.

Door leaves are equipped with roller bearing bottom wheels, running on rails in the floor, and top guide rollers operating on guides overhead. Each leaf rolls horizontally in the opening on its own rail, overlapping the next adjacent leaf by about 2″ when in a closed position. Weathering at the top, bottom and sides make the opening secure against rain and wind.

Door leaves stack either in pockets, inside the building at jambs, or on "A" frames outside the building. The former arrangement is recommended because in this way the rails are covered by the door leaves when the opening is closed and are less likely to become clogged with snow, ice or sand.

* * *

Motor Operated Straight Slide Steel Hangar Doors are similar in outward appearance to the manually operated type. The leaves are constructed to much the same design; they roll horizontally on roller bearing equipped wheels and are held in a vertical position by guide rollers at the top. The two main reasons for motor operation are — if doors are exceptionally heavy, or if it is desired to open and close the door leaves with rapidity.

The power is applied to the two center leaves in the opening by one of three methods.

1. **Traction Drive** by power unit, located in the center leaves, driving the wheels by chain and sprocket.
2. **Chain Drive Overhead** with power units, overhead in pockets, driving endless chains attached to tops of center leaves.
3. **Chain Drive in Trench** with power units, on floor in pockets, driving endless chains in a trench, which are attached to the center leaves at bottom.

In all cases, where there are more than two leaves in an opening, the remaining leaves are moved by a series of interconnecting cables attached to the power leaf, and arranged so that all leaves start to move at the same time and arrive at an open or closed position simultaneously.

* * *

The advantages offered by the Straight Slide Steel Hangar Door are:

A. Low first cost.
B. Smaller amount of collateral steel.
C. Low headroom required over door.
D. Monorails can be run close to inside of door.
E. Perfect clearance on apron and inside so that vehicles or planes can be parked close to the door opening.
F. Deluge sprinkler and lighting systems are easily arranged as there is no interference from door.

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Note: Motor operated doors offer the additional advantage of speed of operation with a maximum conservation of heat.

The disadvantages are:

A. Slow operation with the manually operated door.
B. Loss of heat — as door is opened heat escapes rapidly through top of opening.
C. Snow and ice as well as sand may clog the rails making operation difficult if not sometimes impossible.

TRUSCON STEEL TAIL DOORS

Details and Specifications on pages 11 and 12

Tail doors are a natural complement to Straight Slide Steel Hangar Doors. They provide extra height for the tails of large ships and permit reduction in the height of the slide doors, thus reducing the cost and saving heat when small ships are taken in or out. They are placed in the gable, usually over the center of the door opening. Guides for the slide doors are attached to the bottom of the tail door so that they are clear of the opening when the tail door is open. Electric interlocks are provided so that it is impossible to close the slide doors while the tail door is open or to open the tail door without first opening the slide doors.

They may be either top hinged to swing in, or the vertical lift type. The top hinged door requires less headroom and is simplest in operation. It is picked up, by a series of cables, to a horizontal position. When closed, a series of knuckle braces holds the bottom in position so that the guides are in alignment with the guides attached to the building proper.

The vertical lift tail door may be either one or two section, the latter requiring less headroom. This door rises vertically in guides at the sides. It must be counterweighted, and this is sometimes objectionable.

TRUSCON STRAIGHT SLIDE STEEL HANGAR DOORS

SPECIFICATIONS

1. General — Bidders shall be required to furnish evidence that they are experienced in the manufacture and installation of the type of door specified below and shall, when requested to do so, furnish names of five (5) jobs on which similar doors of their manufacture were used.

2. Scope — (a) All doors so shown and noted on plans shall be Straight Slide Steel Hangar Doors, complete with top and bottom rollers, cane bolts, wheel locks, pull handles, bumpers, weathering, steel panels, steel sash inserts, pilot doors and hardware (electric operator and controls if required), shop coat of paint and installed ready for use.

(b) Work not included under this heading shall consist of:

1. Guide angles, rails and ties.
2. Foundation work.
3. Glass, putty, glazing and field painting.
4. Electric wiring (in case of motor operated doors).

3. Design Data — Main members shall be designed to resist a wind load of 20 lbs. per sq. foot without exceeding an extreme fiber stress of 27,000 lbs. per sq. inch when door is closed. Deflection under the above wind load shall not exceed 1/120 of the span. Extreme fiber stress due to dead loads shall not exceed 24,000 lbs. per sq. inch.

4. Construction — Frame members shall be hot rolled structural shapes, coped where necessary and 100% welded. Welds which interfere with the attachment of panels, sash inserts or weathering shall be ground smooth. No frame member shall be out of line more than ⅛″ in 20′ 0″.

Steel panels shall be 13 ga. roller leveled sheets, set in mastic and attached by means of ¼″-20 round head machine screws not more than 12″ o.c.

Steel window inserts shall be standard fixed pivoted windows. Inside putty glazed. They shall be set in mastic and attached by means of ¼″-20 round head machine screws, approximately 12″ o.c.

5. Hardware — Each door leaf shall be fitted with the following hardware:

Two bottom rollers of the size shown on drawings. Each roller shall be equipped with two (2) sets of roller bearings and pressure type grease fittings. (Wheel brakes may be specified if desired.)

Two sets of top rollers. (Specify either double wheel type on either side of the downstanding leg of a single guide over center of door leaf or single roller operating between two downstanding legs of guides over center of space between leaves or, in the case of motor operated doors, two (2) rollers operating between downstanding legs of two (2) guides over center of space between leaves.) All rollers shall be equipped with bronze bushings.

One cane bolt equipped with compression spring and locking pins. (Cane bolt is optional if wheel brake is used.)

One bar pull attached to leading edge of leaf, except two leaves meeting at center on same track, where weathering interferes, in which case a 1″ round rod about 8″ long shall be welded to the toe of inside flange of vertical member at the leading edge of leaf.

One top guide bumper shall be furnished and attached in field, for the leading edge of each door leaf. At the center of the opening one bumper may serve both leaves. Rail bumpers shall be furnished for the back edge of each door leaf attached to rails in proper location.

6. Weathering — Each door leaf shall be fitted with fabric inserted weathering at the sides and bottom and bent steel plate weathering at the top. Weathering carried around end at leading edge to act as wiper.

7. Painting — Doors shall be given one sprayed-on shop coat of metallic primer before shipment. Hardware and machinery shall be painted with gray machinery enamel.

8. Motor Operator (if required) — Motor operator shall consist of power unit located in the center leaves which drives them in either direction by means of a traction drive. All the leaves in each half of the opening shall be moved by a series of interconnecting cables in such a manner that all leaves start to move at the same time and arrive in the open or closed position simultaneously, **or**

Motor operator shall consist of a power unit located overhead in door pockets which drives the leaves in either direction by means of an endless chain attached to the top of center leaves. All the leaves in each half of the opening shall be moved by a series of interconnecting cables in such a manner that all leaves start to move at the same time and arrive in the open or closed position simultaneously, **or**

Motor operator shall consist of power unit located on the floor in door pockets which drives the center leaves in either direction by means of an endless chain, in a trench beneath the floor, attached to the bottom of the center leaves. All the leaves in each half of the opening shall be moved by a series of interconnecting cables in such a manner that all leaves start to move at the same time and arrive in the open or closed position simultaneously.

Electrical controls shall consist of a drum control station at one (or both) sides of opening by means of which the doors may be opened or closed or stopped in any position; limit switches overhead to automatically stop the doors in the fully open or closed positions; a brake release switch to permit hand operation in case of power failure, and the necessary relays, overload switches and coils to make the system complete. Hand operator shall be provided.

9. Drawings — Arrangement drawings shall be submitted to the Architect (or Engineer) and no fabrication shall be started until approval has been obtained, unless the approving authority specifically waives such action in writing.

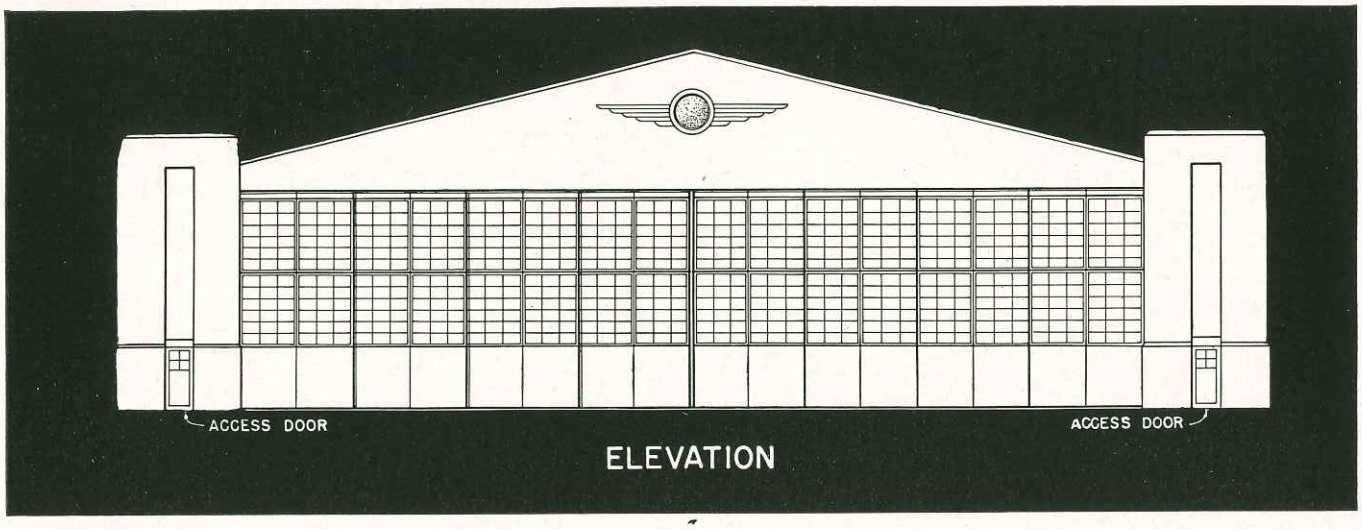
10. Pilot Doors — (It is recommended that access doors be placed in walls of building rather than in doors, in which case they should be specified under another heading.)

Pilot doors shall be provided in the main door leaves, located as shown on architect's drawings. These doors shall have a tubular frame not less than 1¾″ thick. Tubes shall be made of not less than 16 ga. steel. Doors shall be hung on three hinges. Door closers shall be provided where main doors are 6″ or more in thickness. Where main doors are less than 6″ thick spring hinges shall be used. Locks shall be approved, mortise type, with drop handle outside and lever handle inside and shall be fitted with cylinders, thumb turn, latch and dead bolt. (If master keys are required architect should so specify.)

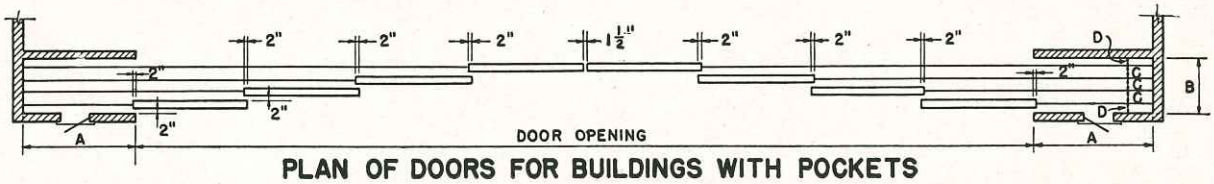
11. Guarantee — Doors, together with their appurtenances, shall be guaranteed by door manufacturer against defects in material and workmanship for a period of one year from date of completion of installation, except replacement of cables due to ordinary wear.

TRUSCON STRAIGHT SLIDE STEEL HANGAR DOORS

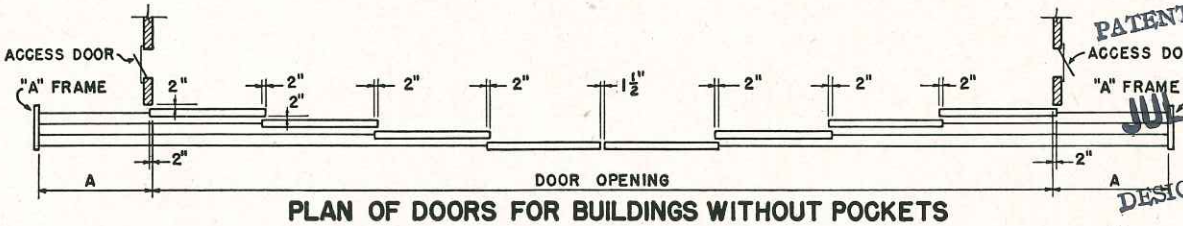
ELEVATION, PLAN VIEW AND STANDARD LEAVES



ELEVATION



PLAN OF DOORS FOR BUILDINGS WITH POCKETS



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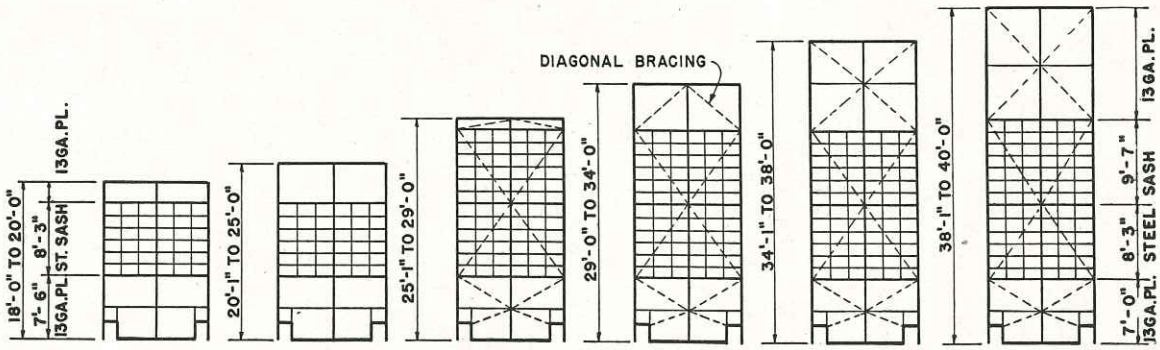
PLAN OF DOORS FOR BUILDINGS WITHOUT POCKETS

NOTE:– THIS SCHEME IS NOT RECOMMENDED

— TABLE OF DIMENSIONS —		
DIMENSION "A"	MINIMUM DEPTH OF DOOR POCKET	WIDTH OF DOOR LEAF PLUS 1'-3"
" "B"	" WIDTH " " "	SUM OF DIMENSIONS "C" & "D"
" "C"	CENTER TO CENTER OF DOORS	DOOR THICKNESS PLUS 2"
" "D"	℄ DOOR TO FACE OF POCKET	HALF DOOR THICKNESS PLUS 2"

NOTE: CLEARANCES AND OTHER DIMENSIONS ARE FOR MANUALLY OPERATED DOORS—FOR MOTOR OPERATED DOORS SEE PAGE 6.



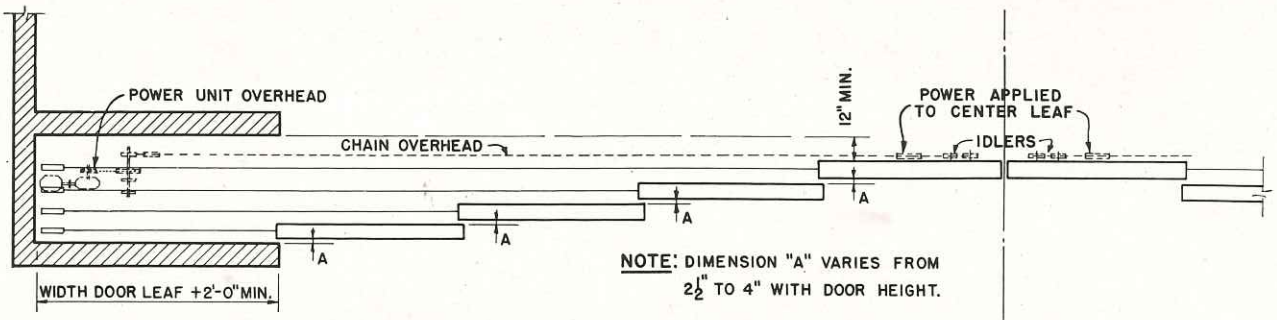
STANDARD DOOR TYPES

DOORS UP TO 20'-0" HIGH		4" THICK
" 20'-1" TO 25'-0" HIGH		5" "
" 25'-1" " 30'-0" "		6 "
" 30'-1" " 35'-0" "		7 "
" 35'-1" " 40'-0" "		8 "

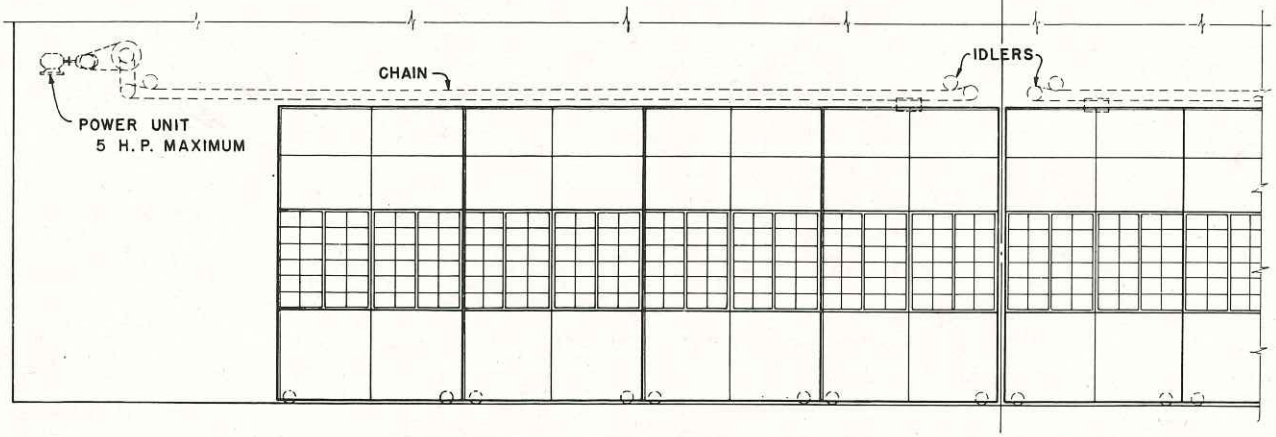
NOTE: DOOR THICKNESSES ARE BASED ON THE FOLLOWING DESIGN DATA:
WIND LOAD 20# PER SQ. FT.
UNIT STRESS 27000# PER SQ. IN.
DEFLECTION 1/120 OF SPAN.

TRUSCON STRAIGHT SLIDE STEEL HANGAR DOORS

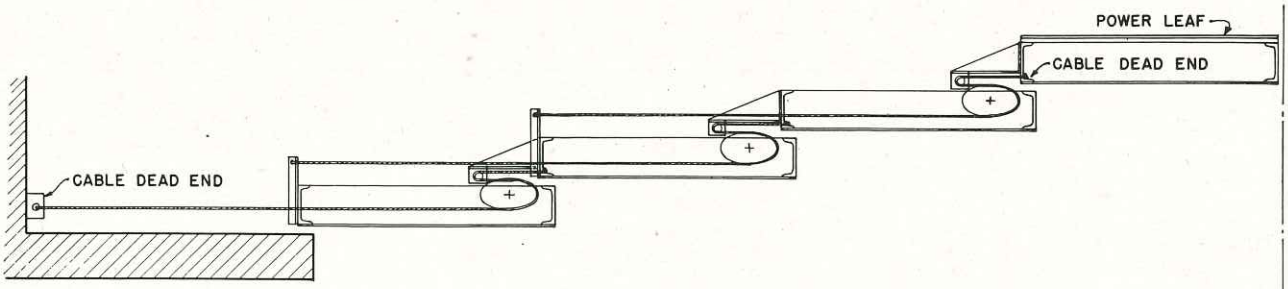
MOTOR OPERATED OVERHEAD TYPE AND INTERCONNECTING CABLE SYSTEM ALSO FURNISHED WITH TRACTION AND TRENCH TYPE OPERATOR



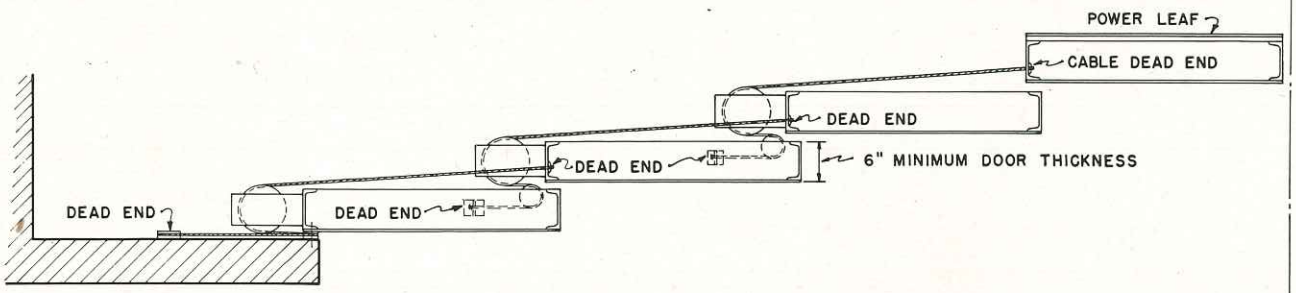
HALF PLAN OF DOOR OPENING



MOTOR OPERATED SLIDE DOORS WITH OPERATOR OVERHEAD



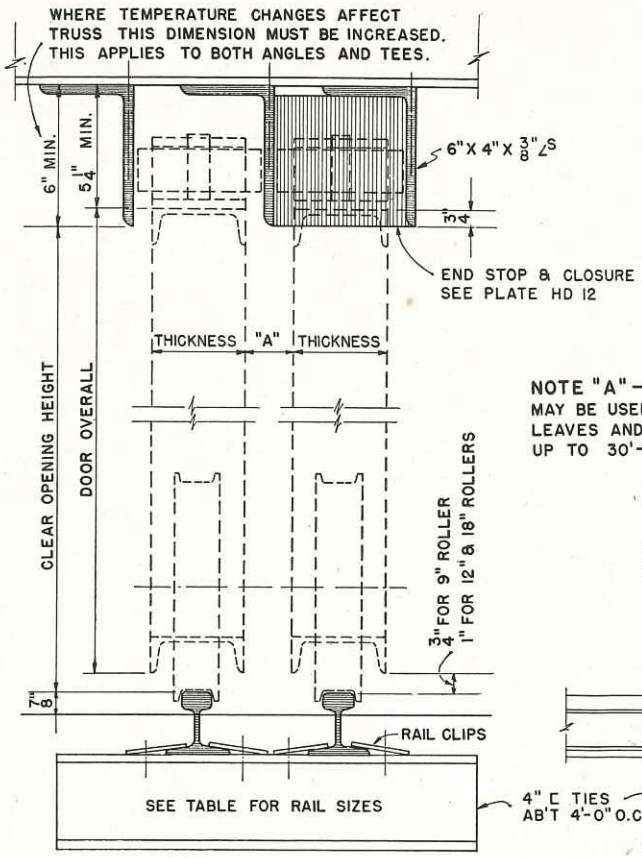
HALF PLAN SHOWING CABLE REEVING TO OPEN DOOR



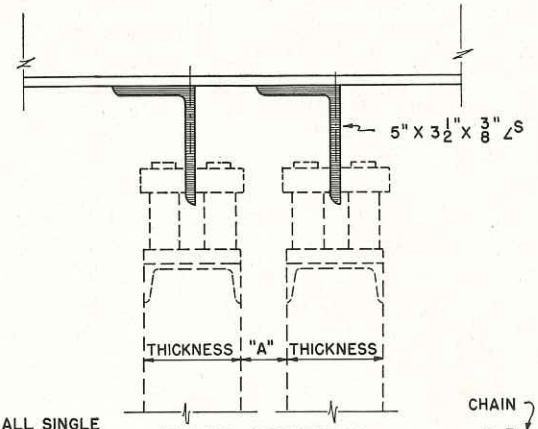
HALF PLAN SHOWING CABLE REEVING TO CLOSE DOOR

TRUSCON STRAIGHT SLIDE STEEL HANGAR DOORS

DETAILS—TOP GUIDES AND BOTTOM RAILS

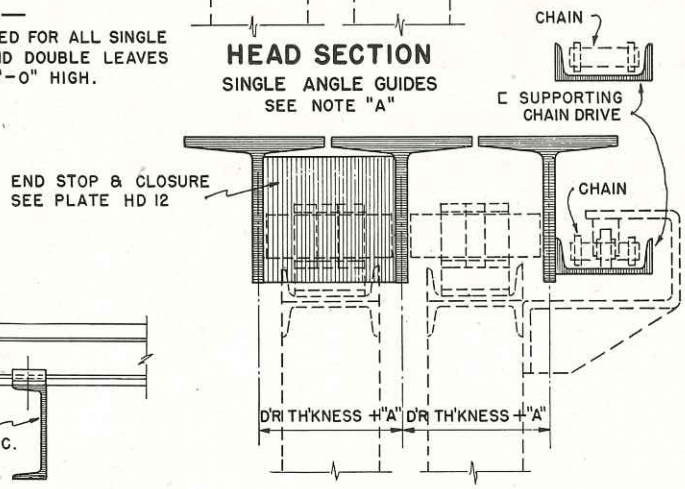


VERTICAL SECTION
DOUBLE ANGLE GUIDES

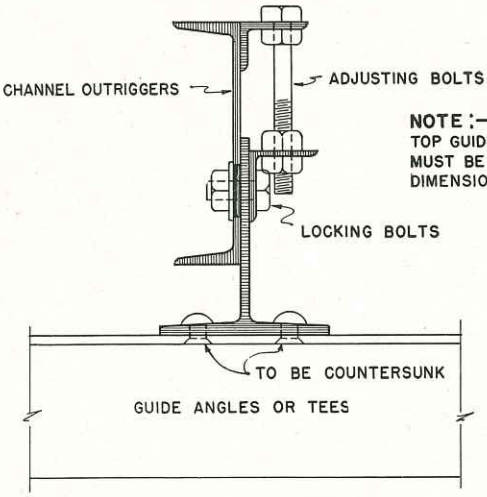


HEAD SECTION
SINGLE ANGLE GUIDES
SEE NOTE "A"

NOTE "A"—
MAY BE USED FOR ALL SINGLE LEAVES AND DOUBLE LEAVES UP TO 30'-0" HIGH.

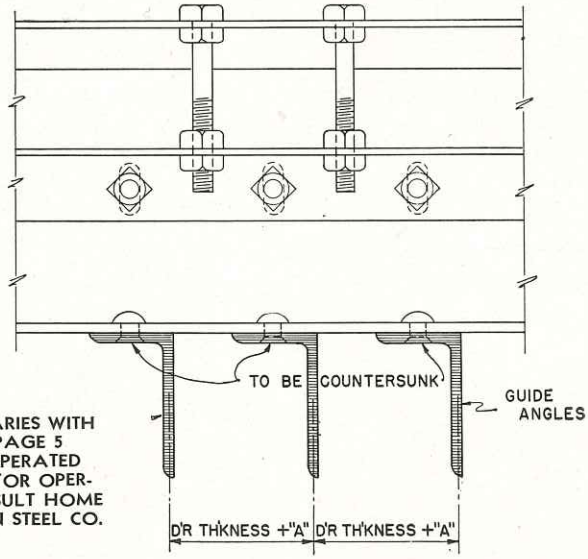


HEAD SECTION
DOUBLE "T" GUIDES



SECTION THRU OUTRIGGER

NOTE:—
TOP GUIDES AND BOTTOM RAILS MUST BE SET TRUE AND LEVEL. DIMENSIONS MUST BE HELD.



ELEVATION OF OUTRIGGER

NOTE:—
DIMENSION "A" VARIES WITH CONDITIONS—SEE PAGE 5 FOR MANUALLY OPERATED DOORS.—FOR MOTOR OPERATED DOORS CONSULT HOME OFFICE OF TRUSCON STEEL CO.

SUGGESTED DETAIL FOR ADJUSTING TOP GUIDES

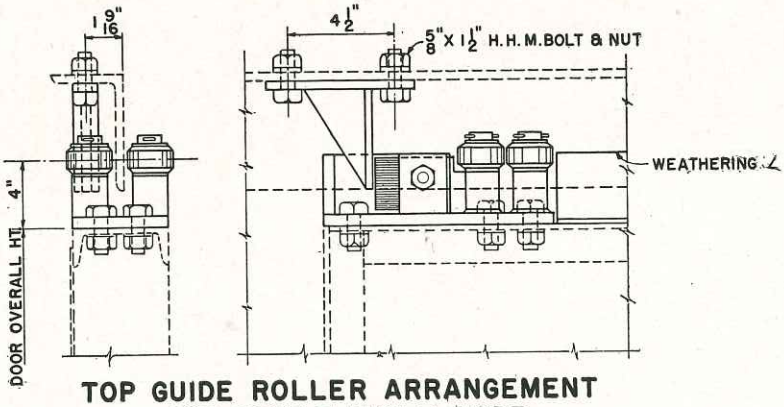
—RECOMMENDED SIZE OF RAILS—						
16#	A.S.C.E.	RAIL	FOR	9"	BOTTOM	ROLLERS
20#	"	"	"	12"	"	"
30#	"	"	"	18"	"	"

NOTE:—
SEE PAGE 8 FOR SIZE OF ROLLERS.

NOTE:—
ALL MATERIAL SHOWN IN FULL LINES NOT FURNISHED BY TRUSCON STEEL CO.

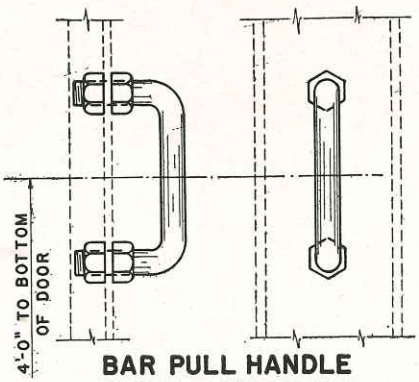
TRUSCON STRAIGHT SLIDE STEEL HANGAR DOORS

HARDWARE DETAILS



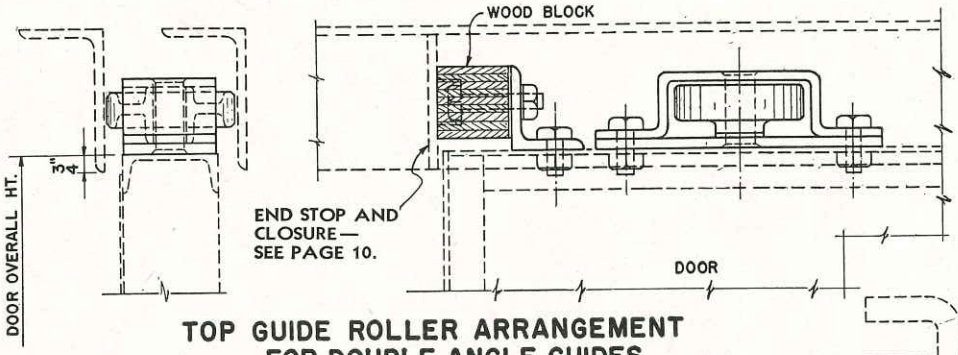
TOP GUIDE ROLLER ARRANGEMENT FOR SINGLE ANGLE GUIDE

FOR USE ON ALL SINGLE LEAVES AND ON DOUBLE LEAVES UP TO 30'-0" HIGH

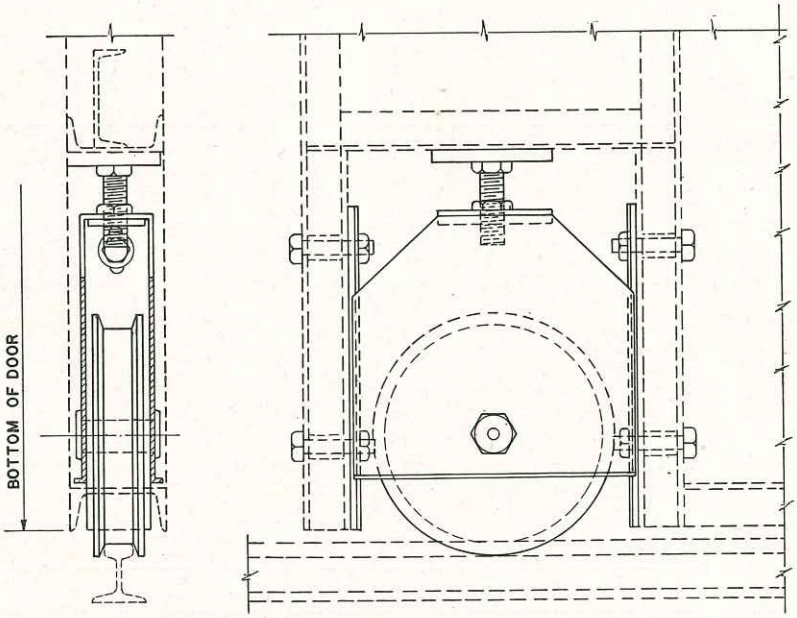


BAR PULL HANDLE

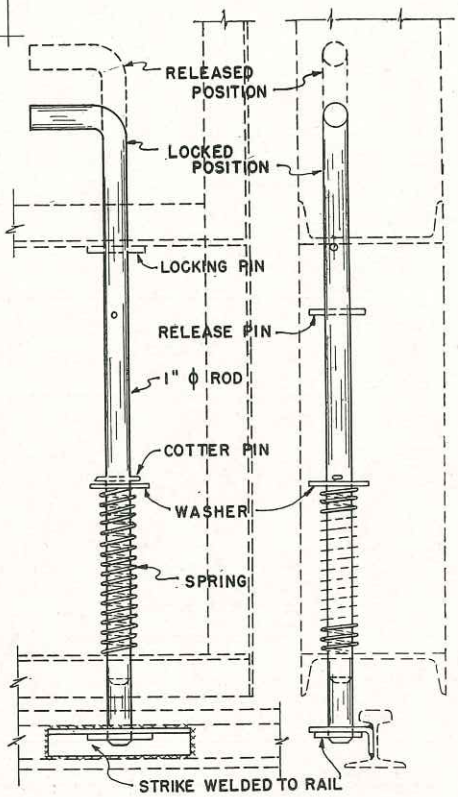
LOCATED ON FORWARD EDGE OF ALL LEAVES EXCEPT CENTER LEAVES.



TOP GUIDE ROLLER ARRANGEMENT FOR DOUBLE ANGLE GUIDES



BOTTOM ROLLER

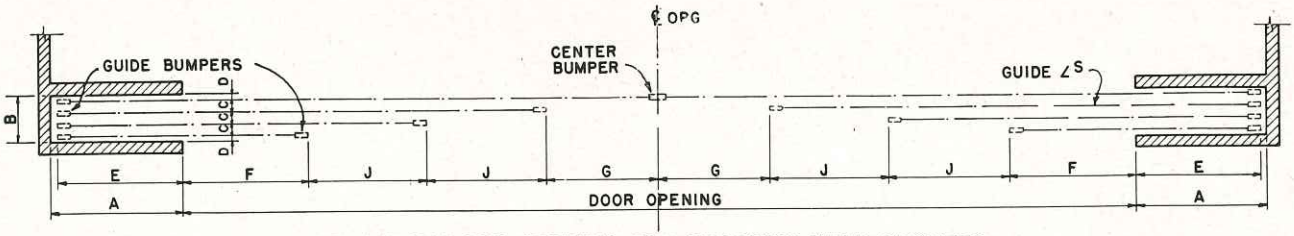


CANE BOLT

SIZE OF BOTTOM ROLLERS		
ROLLER SIZE	SINGLE LEAVES	DOUBLE OR TRIPLE LEAVES
9"	UP TO 12'-0" X 28'-0"	UP TO 500 SQ. FT.
12"	12'-0" X 29'-0" TO 12'-0" X 40'-0"	501 TO 700 SQ. FT.
18"		701 TO 1500 SQ. FT.

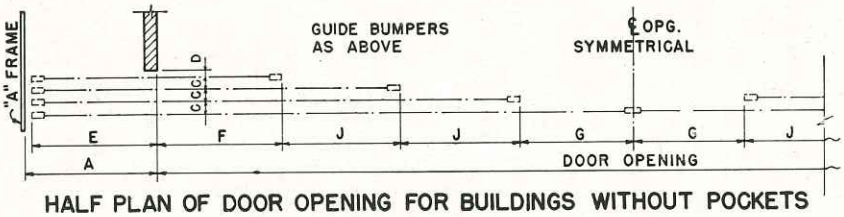
TRUSCON STRAIGHT SLIDE STEEL HANGAR DOORS

PLAN OF TOP GUIDES AND BOTTOM RAILS



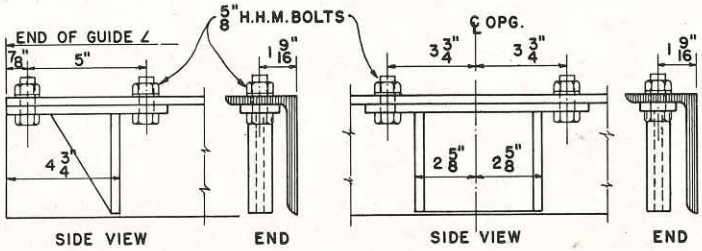
PLAN OF DOOR OPENING FOR BUILDINGS WITH POCKETS
SHOWING GUIDES ABOVE DOOR

GUIDE BUMPERS IN POCKETS & "A" FRAMES NOT FURNISHED IF TRACK BUMPERS ARE USED.



HALF PLAN OF DOOR OPENING FOR BUILDINGS WITHOUT POCKETS
SHOWING GUIDES ABOVE DOOR

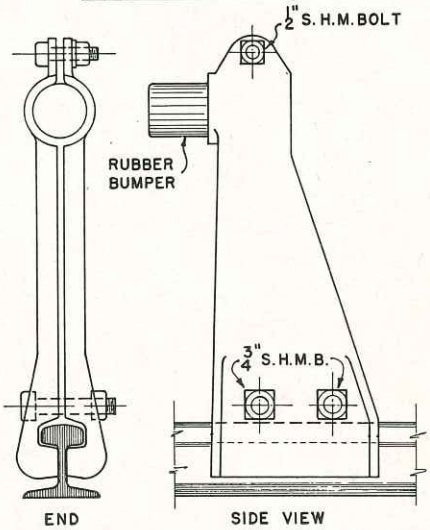
— TABLE OF DIMENSIONS —	
A	WIDTH OF DOOR LEAF + 1'-3"
B	SUM OF "C" & "D" DIMENSIONS
C	THICKNESS OF DOOR LEAF + 2"
D	HALF THICKNESS OF LEAF + 2"
E	WIDTH OF DOOR LEAF + 3"
F	WIDTH OF DOOR LEAF + 1"
G	WIDTH OF DOOR LEAF − 4 1/2"
H	WIDTH OF DOOR LEAF + 11"
J	WIDTH OF DOOR LEAF − 2"
K	WIDTH OF DOOR LEAF − 1 1/2"
— SEE NOTE "A" —	



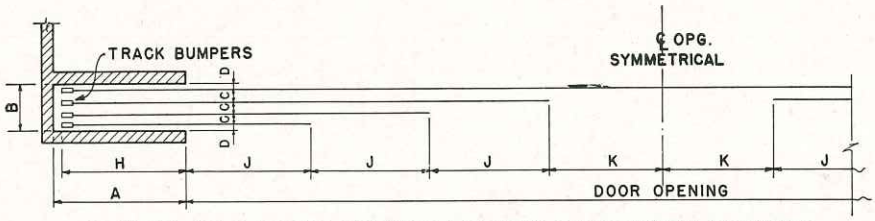
END GUIDE BUMPER

CENTER GUIDE BUMPER

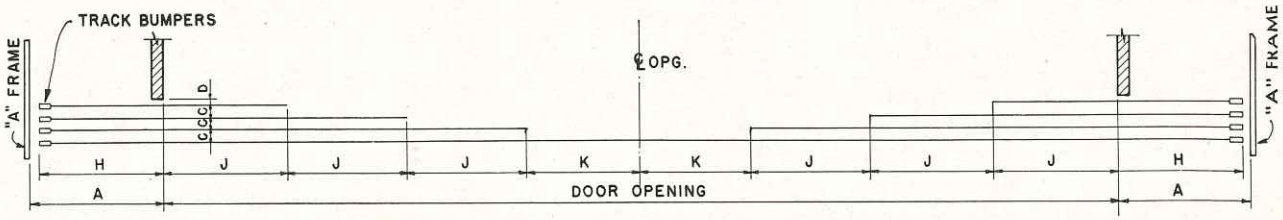
FOR USE ON ALL SINGLE LEAVES AND DOUBLE LEAVES UP TO 30'-0" HIGH



TRACK BUMPER



HALF PLAN OF DOOR OPENING FOR BUILDINGS WITH POCKETS
SHOWING TRACKS IN FLOOR

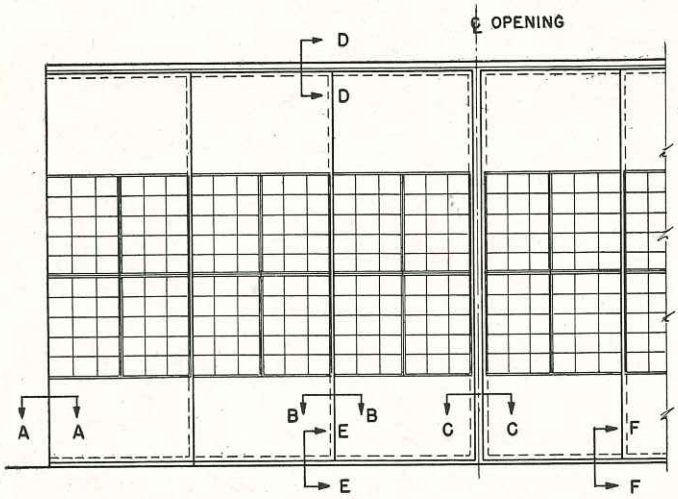


PLAN OF DOOR OPENING FOR BUILDINGS WITHOUT POCKETS
SHOWING TRACKS IN FLOOR

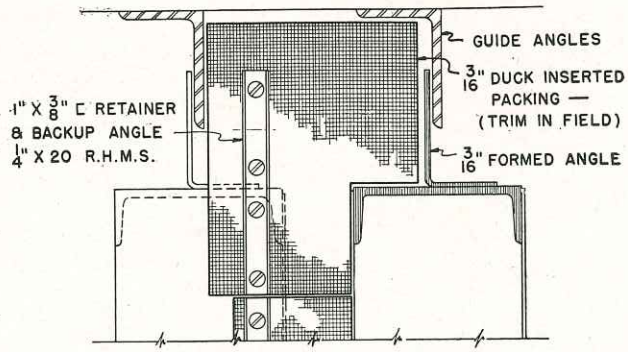
NOTE "A" —
CLEARANCES AND OTHER DIMENSIONS ARE FOR MANUALLY OPERATED DOORS — FOR MOTOR OPERATED DOORS SEE PLATES HD 10 & HD 11.

TRUSCON STRAIGHT SLIDE STEEL HANGAR DOORS

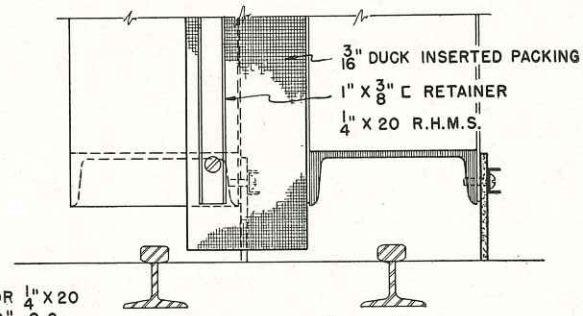
ELECTRICALLY OPERATED HANGAR DOOR AND TOP HINGED TAIL DOOR



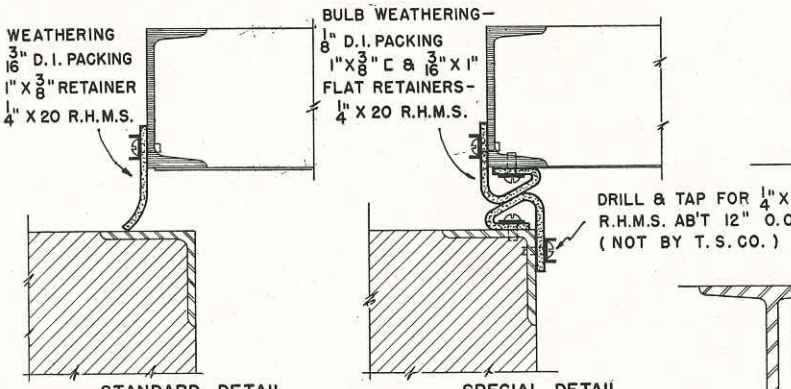
PART ELEVATION OF DOOR OPENING



SECTION "D-D"
FOR SINGLE GUIDES

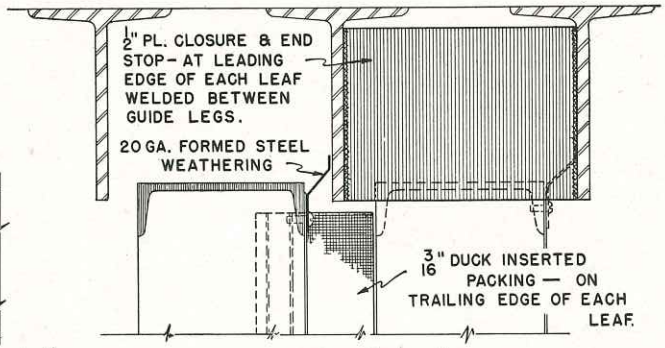


SECTION "E-E"

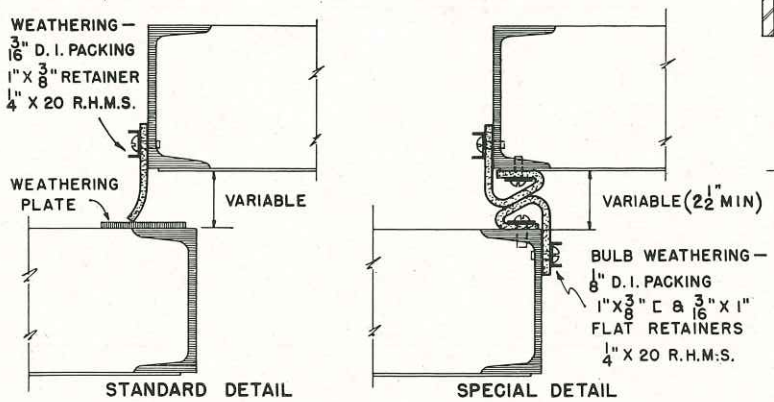


STANDARD DETAIL SPECIAL DETAIL

SECTIONS "A-A"

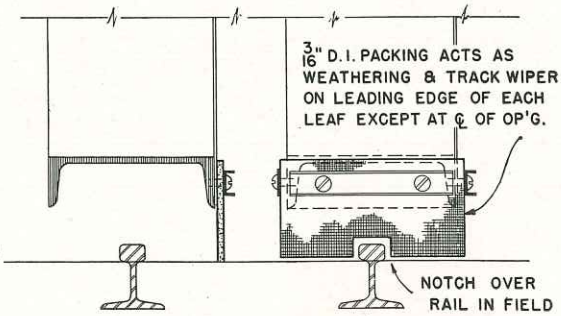


SECTION "D-D"
FOR DOUBLE GUIDES

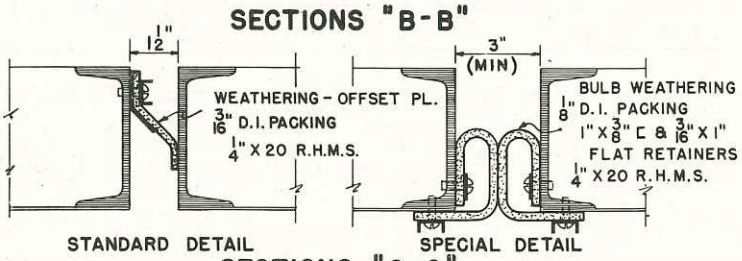


STANDARD DETAIL SPECIAL DETAIL

SECTIONS "B-B"



SECTION "F-F"

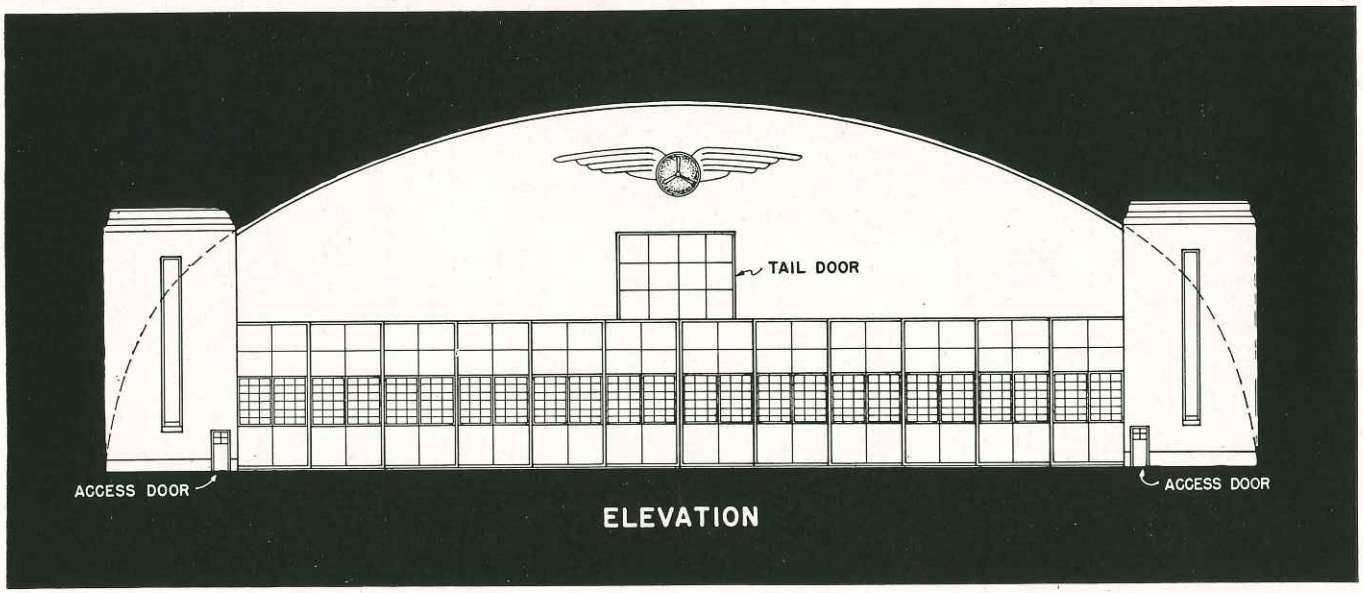


STANDARD DETAIL SPECIAL DETAIL

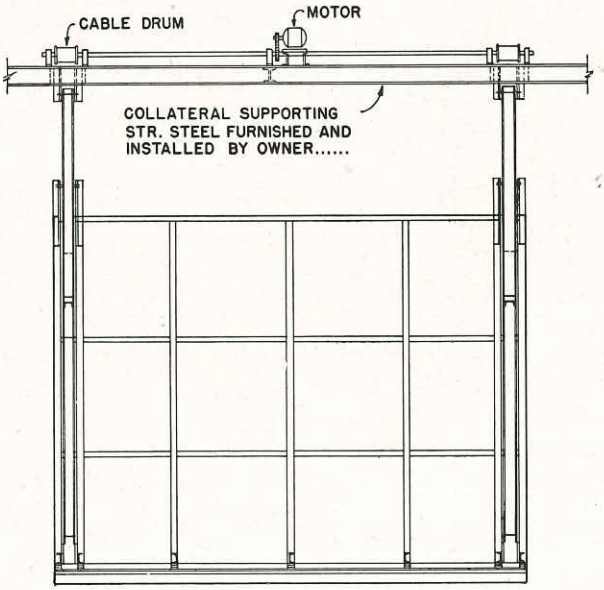
SECTIONS "C-C"

TRUSCON STEEL TAIL DOORS

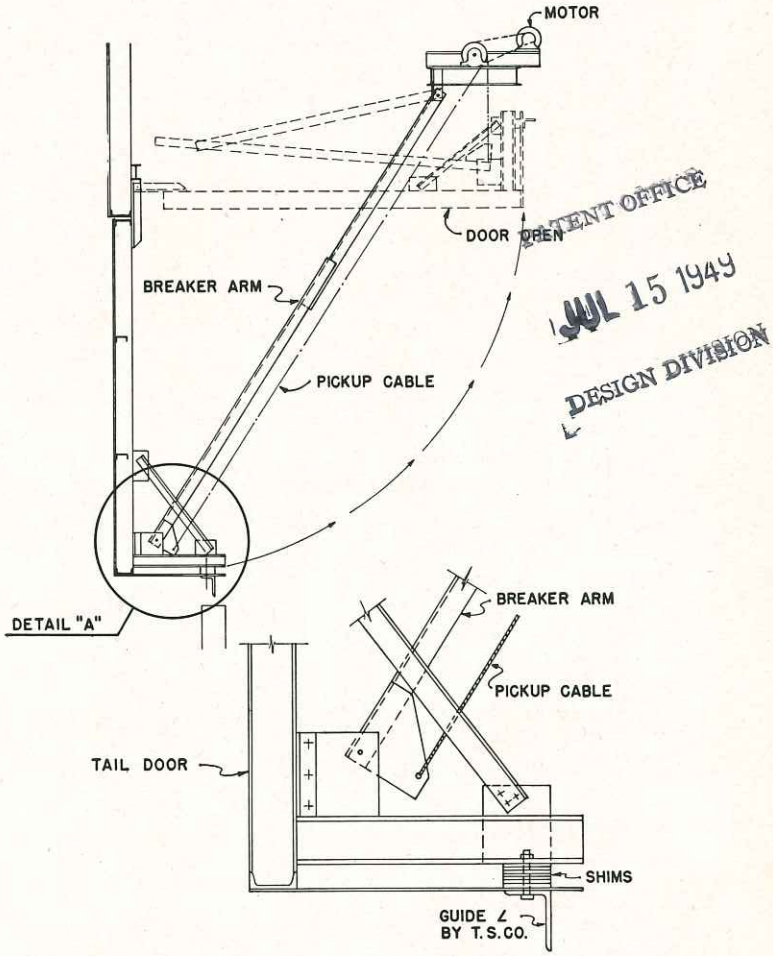
MOTOR OPERATED TOP HINGED TYPE



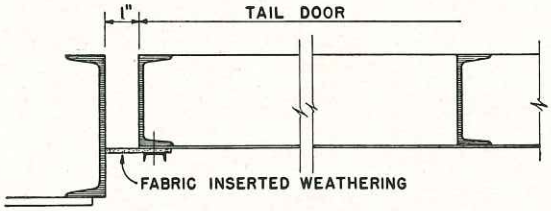
ELEVATION



INSIDE ELEVATION



PATENT OFFICE
JUL 15 1949
DESIGN DIVISION



HORIZONTAL SECTION

DETAIL "A"

TRUSCON STEEL TAIL DOORS

SPECIFICATIONS

1. General — Bidders must furnish evidence of their experience in the manufacture of the type of door specified hereinafter and shall, upon request, furnish a list of five (5) such installations.

2. Scope — (a) All doors so shown and noted on plans shall be motor operated, top hinged to swing in (two section vertical lift) (one section vertical lift) tail doors complete with power unit, electrical controls, shafting, drums, sheaves, cables, etc., necessary for a complete job and installed ready to operate.

(b) Work not included under this heading shall consist of:

1. Collateral steel supporting power unit, shafting, etc.
2. Counterweight guides and enclosures where required.
3. Glass, putty, glazing and field painting.
4. Electric wiring.

3. Design Data — Main members shall be designed to resist a wind load of 20 lbs. per sq. foot without exceeding an extreme fiber stress of 27,000 lbs. per sq. inch. Deflection under the above wind load shall not exceed 1/120 of the span. Extreme fiber stress due to dead loads shall not exceed 24,000 lbs. per sq. inch.

4. Construction — Frame members shall be hot rolled structural shapes, coped where necessary and 100% welded. Welds which interfere with attachment of steel panels, window inserts, weathering, or other equipment shall be ground smooth. All members shall be straight and true, and no member shall be out of line more than ⅛″ in 20′ 0″.

Steel panels shall be 13 ga. roller leveled sheets set in mastic and attached by means of ¼″-20 round head machine screws, not more than 8″ o.c.

Sash inserts shall be constructed of hot rolled sash sections, arranged for inside putty glazing, set in mastic and attached to frame members by means of ¼″-20 round head machine screws not more than 12″ o.c.

5. Operator — (Top Hinged Door) — Door shall be operated by cables which collapse a series of knuckle braces and at the same time swing the door to a horizontal position. Each cable shall be wound on a drum which is keyed to the line shaft which in turn is driven by a motor-reducer unit by means of sprockets and chain. The whole power assembly shall be mounted on strut members between the first and second truss. The top of the door shall be hung on heavy off-set hinges in such a manner as to be entirely clear of the opening when in a horizontal position. When closed, the knuckle braces shall hold the door firmly in a vertical position so that the guides for slide door, which are attached to the bottom of same, will be in line with the guides which are attached to the building at either side.

Two-Section Vertical Lift Door — The top and bottom leaves shall be picked up by a series of cables operating over sheaves to a counterweight at one side of opening and over a set of gripper sheaves driven by a motor with chain and sprocket drive.

Single-Section Vertical Lift Door — Doors shall be picked up by a series of cables operating over idler sheaves to the power unit which is located directly over the counterweight.

6. Weathering — Top Hinged Door — Flat $\frac{3}{16}$″ duck inserted packing shall be attached to the underside of the soffit at top of door and to each jamb of door, held in place by ½″ x 1″ C. R. channel retainers and arranged so as to make proper contact on three sides to insure a weathertight job.

Two-Section Vertical Lift Door — Flat $\frac{3}{16}$″ duck inserted packing shall be attached to the top of the lower leaf by means of ½″ x 1″ C. R. channel retainers and shall project to contact the inside of upper leaf in such a manner as to make a weathertight job.

Single-Section Vertical Lift Door — (requires no weathering).

7. Painting — Door leaves shall be given one sprayed-on coat of metallic primer before shipment. Hardware and machinery shall be finished with gray machinery enamel.

8. Electrical Controls — Electrical controls furnished by door contractors shall consist of a drum control station at either or both jambs of slide door below (as specified), limit switches to stop door in open and closed position, interlocking contacts with slide door to prevent attempting to open tail door while slide doors are closed, necessary relays, coils, overload switches, etc.

9. Drawings — Arrangement drawings shall be submitted to the architect for approval and no fabrication shall be started until such approval has been obtained, unless the architect specifically waives such approval in writing.

10. Guarantee — All doors, together with their appurtenances, shall be guaranteed against defects in materials or workmanship for a period of one year from date of completion of installation, except replacement of cable due to ordinary wear.

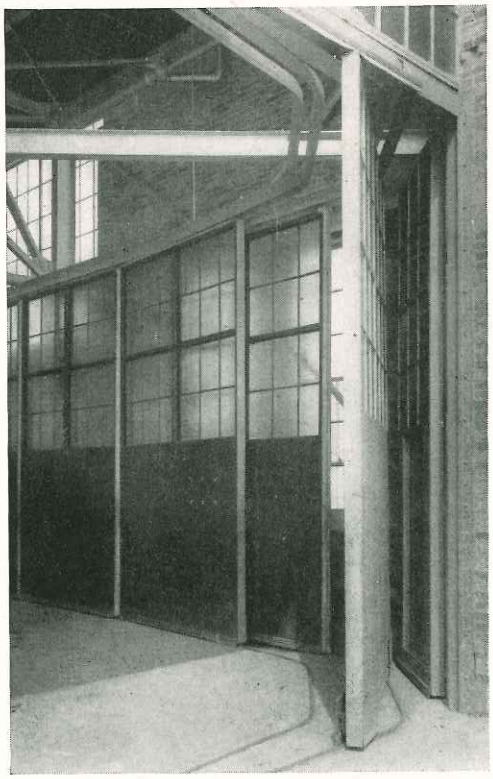
TRUSCON CURVED TRACK STEEL HANGAR DOORS

This type door was evolved to meet the requirements for a door to close the entire side of a large hangar. The door units operate on separate curved tracks which parallel each other, and when open the doors lie flat against the inside wall of the hangar to allow maximum opening.

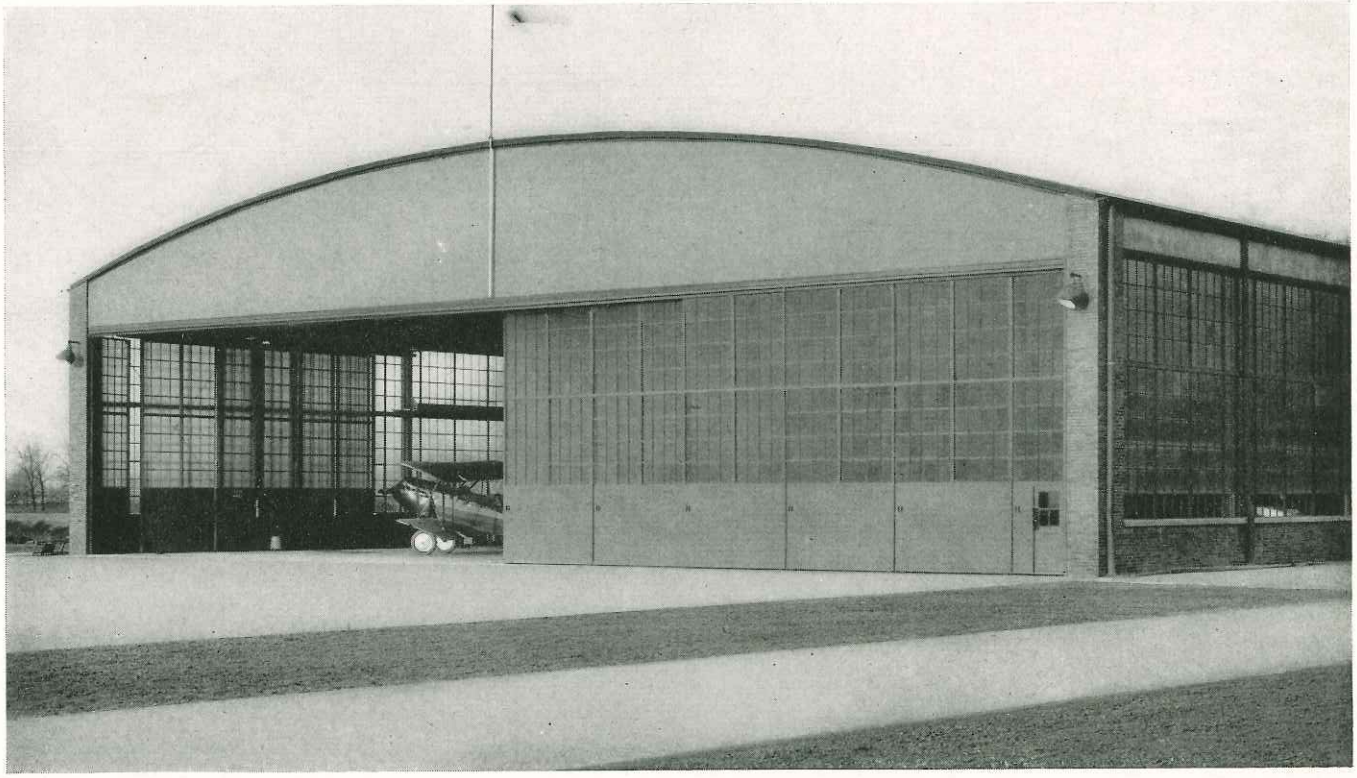
Curved track door leaves are made from hot rolled structural shapes. Doors are of all welded design. The tolerances usually allowed on structural steel are not permitted on Truscon Doors.

Each door is mounted on heavy malleable or pressed steel wheels encased in the door itself, these wheels being equipped with adjustable roller swivels and roller bearings. They bear the entire weight of the door. Bronze bushed rollers at the door head act as guides when the door moves on the track.

As in all Truscon Doors, the upper portions are fitted with Steel Windows to admit light. Lower panels are of 13-gauge steel, rigidly attached to stiles and rails by machine screws. Mastic is applied under window and steel panels to form weather-tight connections. A standard pilot door can be provided in the lower portion of one unit of each set if required.



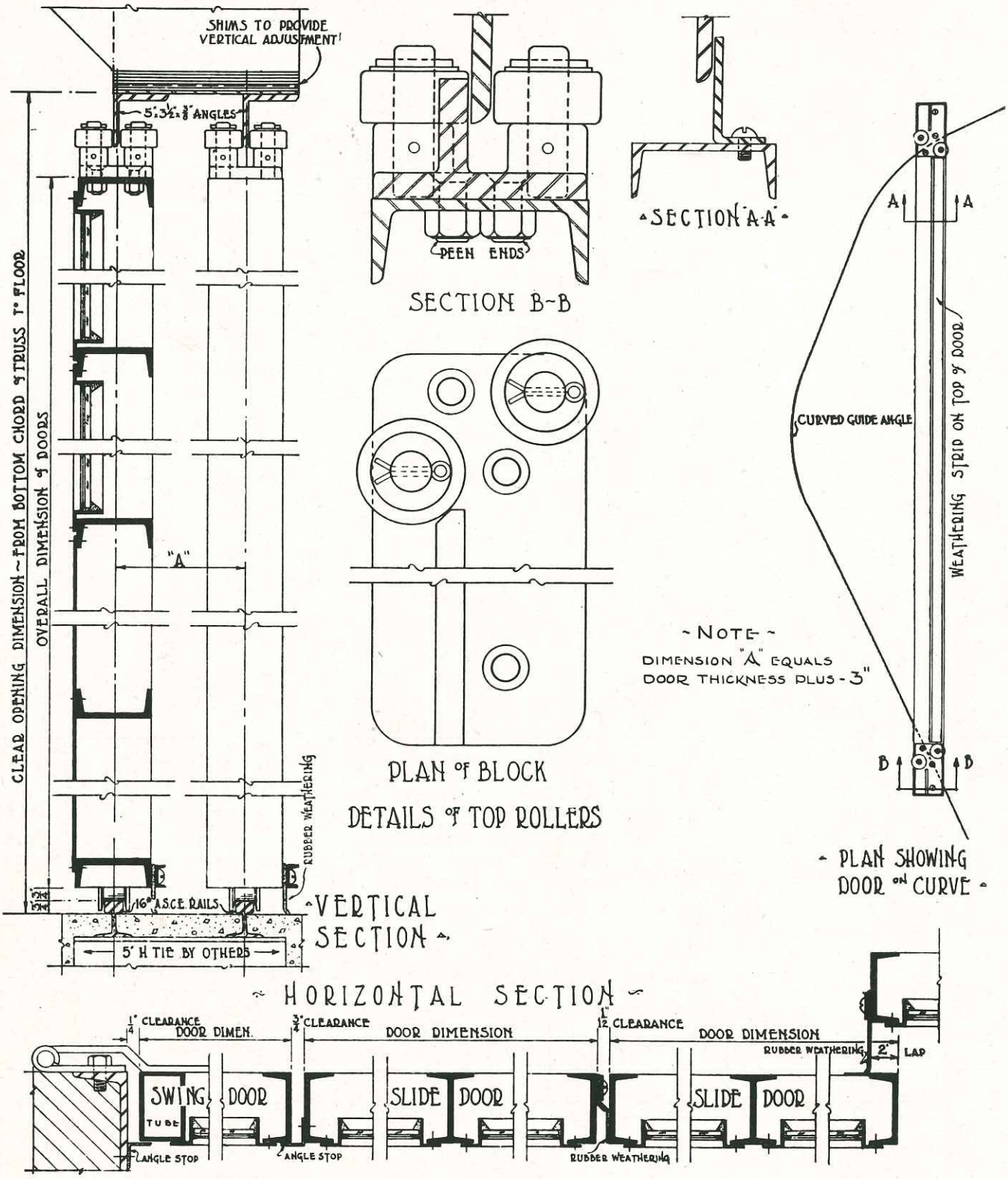
CURVED TRACK TYPE STEEL HANGAR DOORS CAN BE FURNISHED WITH MOTOR OPERATORS



Curved Track Type Hangar Doors — Door illustrated is 110′ x 20′

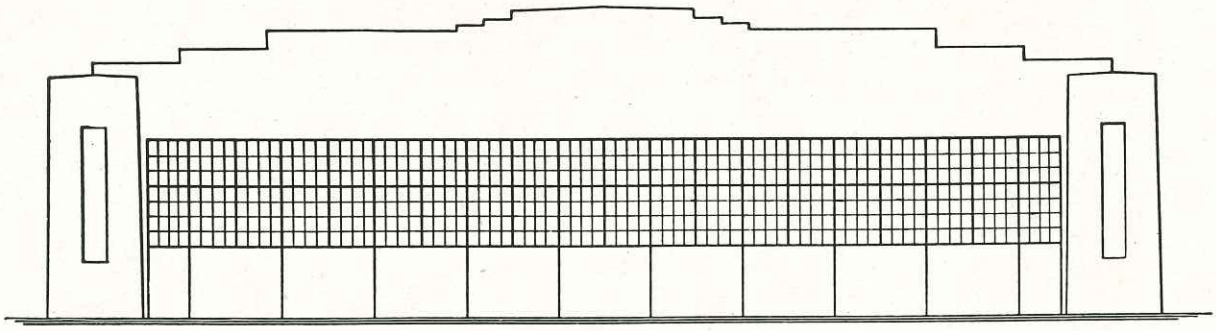
TRUSCON CURVED TRACK STEEL HANGAR DOORS

CHANNEL CONSTRUCTION DETAILS



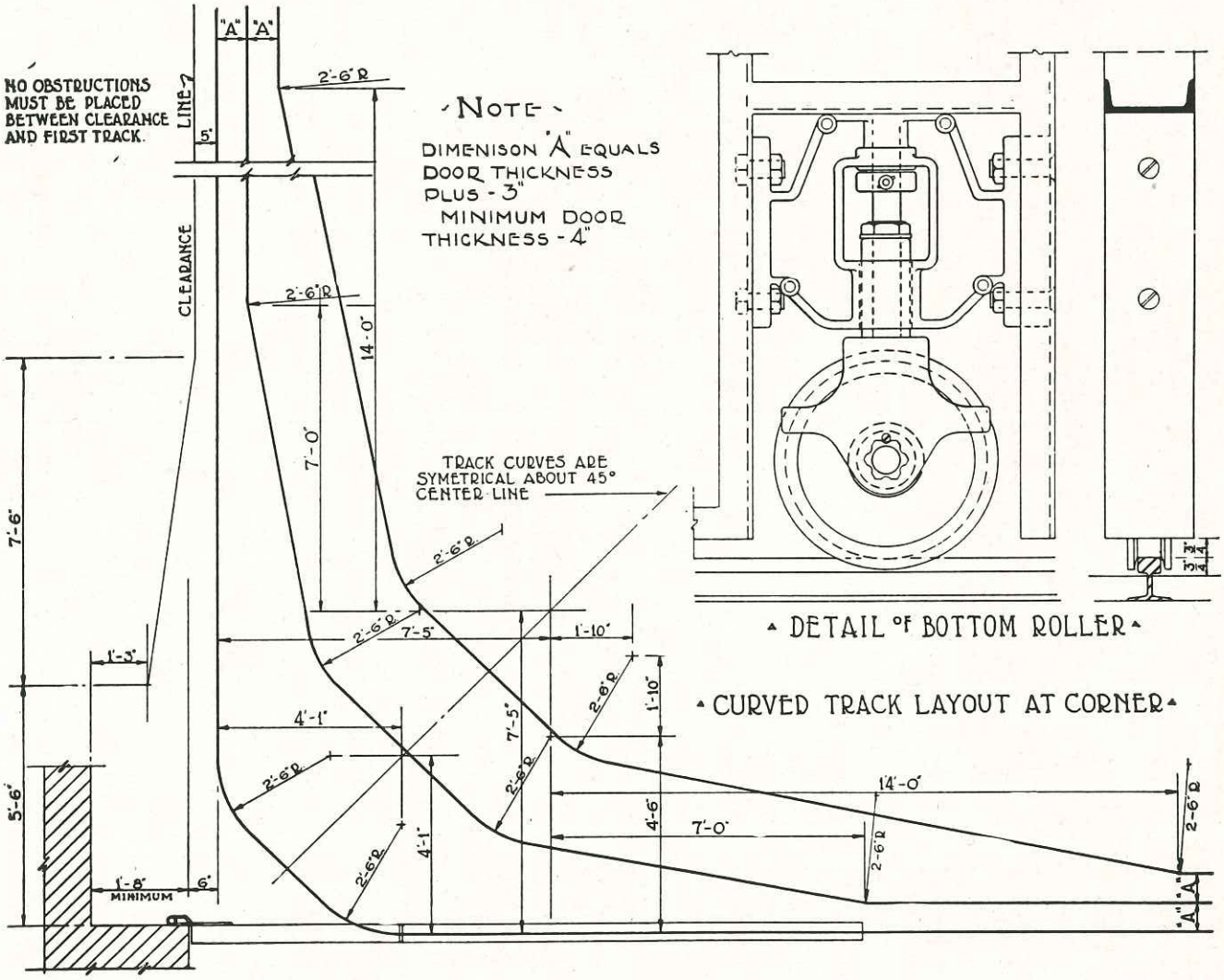
TRUSCON CURVED TRACK STEEL HANGAR DOORS

TRACK LAYOUT AND DETAILS



ELEVATION

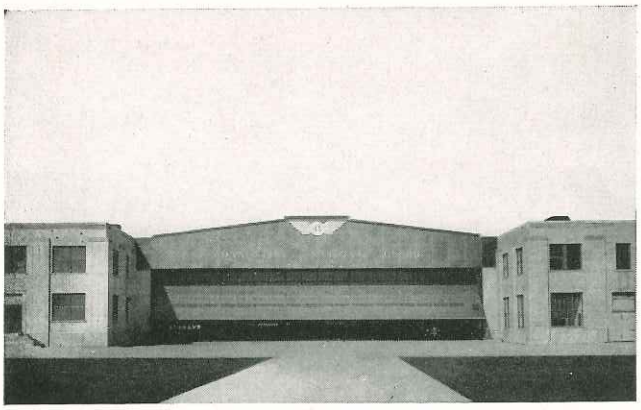
PLAN



DETAIL OF BOTTOM ROLLER

CURVED TRACK LAYOUT AT CORNER

TRUSCON UNBRACED CANOPY STEEL HANGAR DOORS



The Unbraced Canopy Door is designed especially for all openings not exceeding 26′ high and 100′ in width. The horizontal components of the wind load, upon the door when it is operating, are carried by a built-up girder across the bottom of the door and rollers to the jambs; for this reason it is only possible to build one operating section for the opening. The door is divided horizontally into two leaves, the top leaf being hinged to the lintel and the bottom one hinged to the top leaf. As the door is lifted by the cables the door-leaves fold together, the top leaf inside the building behind the lintel and the bottom leaf partly inside and partly outside to form a canopy. The top leaf serves as a baffle to prevent the wind blowing in over the top to damage the roof covering and to prevent heat escaping from the top of the hangar if the door is partially opened.

This door requires a minimum of head room and can be easily installed in hangars constructed with bow string trusses.

CONDENSED SPECIFICATIONS

1. General — All doors shown on drawings shall be of the Unbraced Canopy Type Door, as manufactured by Truscon Steel Company, Youngstown, Ohio. No substitution shall be made without the written consent and approval of the architect.

2. Scope of Work — The door contractor shall furnish the door leaf complete with the counterweights and operating mechanism, electric motors and controls. Collateral steel, such as machinery, supports, counterweight supports and towers, also catwalk, to be furnished by structural steel contractor.

3. Construction — (a). The door leaves shall be constructed in panels made up of structural members (covered by steel windows or 13 ga. steel sheets) coped and welded together and in convenient sizes for shipment and erection. The vertical members behind the bottom leaf shall be at least 8″ deep. The section along the bottom shall be at least 18″ deep. All members shall be assembled in the field by bolting and where necessary shall be welded.

(b). The upper portion of the door shall be filled with hot rolled steel sash divided into lights as shown on the drawing. The sash shall be arranged for putty glazing with four spring wire glazing clips per light.

(c). Pilot doors, made from 1¾″ x 5″ x No. 16 ga. tubes with butted corners shall be fitted into the main doors where shown on the drawing.

(d). The bottom portion of door to a height of approximately 5′ 6″ to be covered with No. 13 ga. sheets.

4. Weathering — The main door shall be provided with metal to metal weathering at the jambs. Two-ply duck insert rubber packing will be furnished with the door to insure the proper contact between the head of the door and the opening. The floor should be designed to have a 1″ rise immediately behind the door. The bottom of the doors are held in their closed position by automatic locking bolts fitted to the door. Floor plates for these bolts will be furnished with the door, but must be set in the floor by the general contractor.

5. Operating Mechanism — (a). The operating mechanism shall be designed with a positive driving mechanism. The door shall be suspended on alloy steel wire ropes with self-lubricating hemp center. Each rope shall have an easy accessible threaded adjustment and a graphite bronze bushed fitting at its lower end, where it is attached to the door. The upper ends of the rope shall be clamped to a cast iron drum.

(b). The counterweights shall be located at the jambs of the opening and supported by cables and drums. The counterweight shall consist of a weight rack on which cast concrete slabs of convenient size and weight can be stacked. The cables supporting the weights must be connected so that each carries its proportional load. The counterweight guides and guards, along with the jamb roller guides, are to be furnished with the structural steel for the building. The concrete for counterweights will be furnished with the door.

6. Electrical Operator — (a). The main operating door will be driven by a roller chain drive from a self-contained gear motor unit. This unit shall consist of high quality alloy steel cut gears mounted on precision ball or roller bearings and enclosed in an oil-tight cast iron case and it shall be reversible. The unit shall be fitted with a motor mounted magnetic brake of a capacity equivalent to the torque of the motor. This brake shall have a hand release which operates in conjunction with the emergency hand-operating clutch lever. An emergency hand chain operator shall be located adjacent to one of the counter-weight enclosures.

(b). A standard 3-pole type magnetic reversing switch shall be furnished for each motor. Positive type "Open" and "Close" hatchway limit switches, along with a safety switch which prevents operation of the door with the motor when the hand-operating clutch is engaged, shall also be furnished.

7. Design Data — The leaves and structural members of the door shall be designed so that the fiber stresses, due to dead load and impact, shall not exceed 24,000 lbs. per sq. in. The impact shall be figured at 25% of the dead load. Stresses, due to wind loads, shall be figured at 27,000 lbs. per sq. in. The door shall be designed to withstand a wind load of 20 lbs. per sq. ft., when closed, and 10 lbs. per sq. ft. when opened to an angle of 45 degrees.

8. Shop Painting — All panels and structural work shall be given a shop coat of the manufacturer's standard metallic primer before shipment. The machinery shall be painted with one coat of gray enamel.

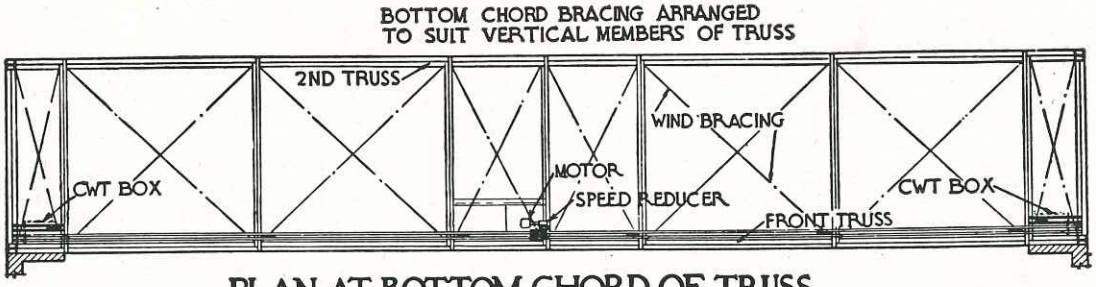
9. Erection — The erection of the door and operating equipment is to be done by the door manufacturer. He shall also set the motors and limit switches and adjust the limit switches after they are wired. The erection of the push-buttons and reversing panel is to be done by the electrical contractor.

10. Electrical Wiring — The electrical contractor shall furnish all conduit and wire and do all the necessary wiring between the motors, control panels and switches. He shall furnish fused type safety switch of the proper capacity on the feed lines ahead of each reversing panel.

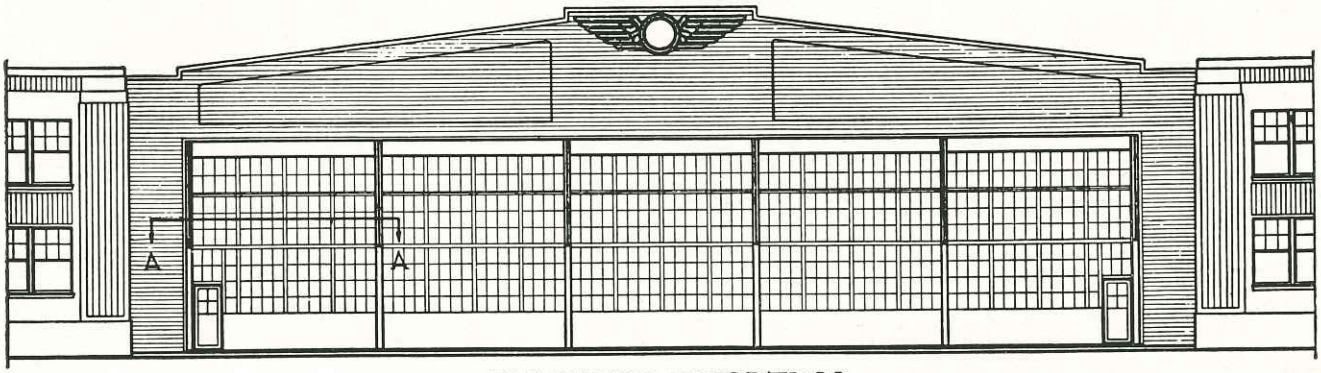
11. Glazing — The glass, glazing and putty are to be furnished by the glazing contractor.

TRUSCON UNBRACED CANOPY STEEL HANGAR DOORS

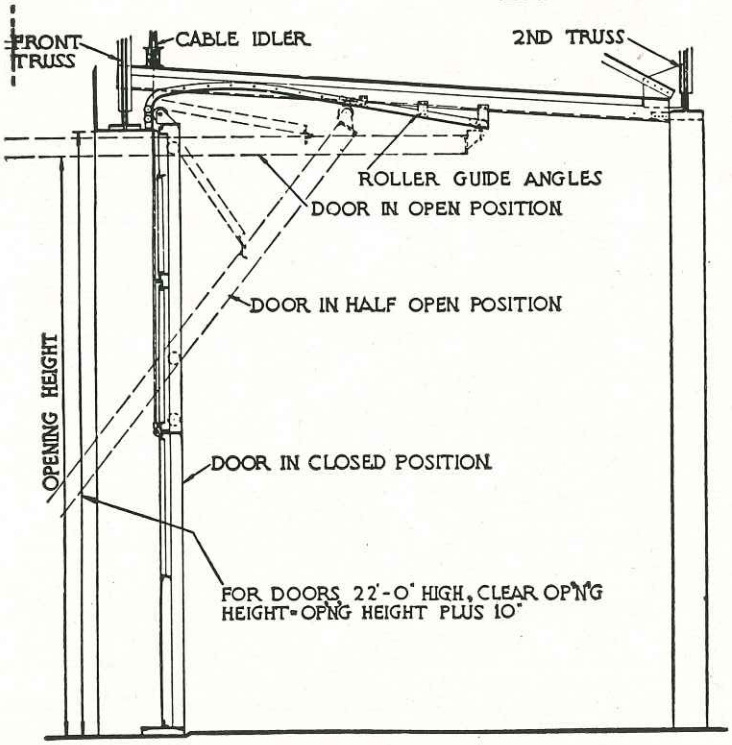
ELEVATION AND CONSTRUCTION DETAILS



PLAN AT BOTTOM CHORD OF TRUSS

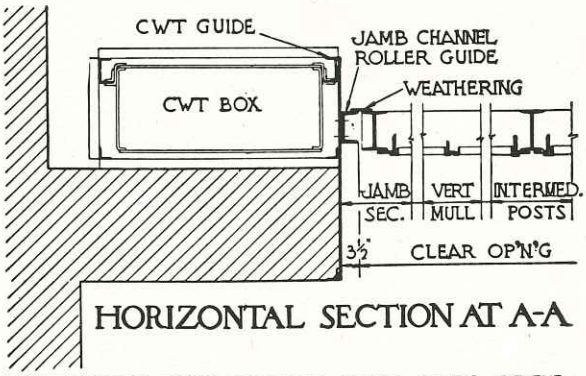


EXTERIOR ELEVATION



VERTICAL SECTION

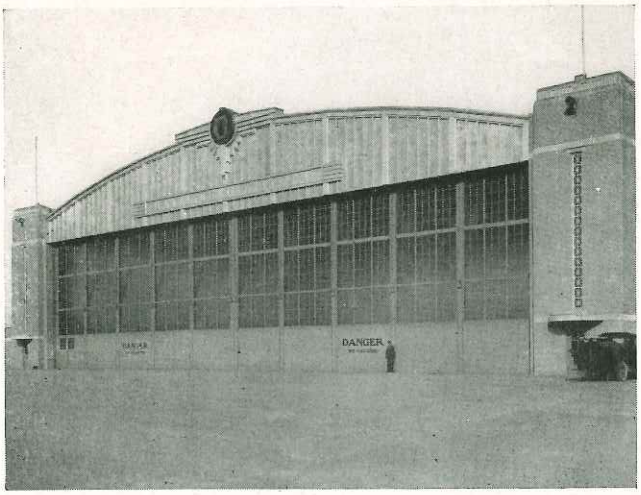
NOTE: DOOR MOVEMENT IS CONTROLLED BY LIMIT SWITCHES.~ THREE BUTTON CONTROL STATION AND REVERSING RELAY PANEL ARE LOCATED ON SIDEWALL ADJACENT TO JAMB OF OPENING, EXACT LOCATION TO BE DETERMINED BY ARCHITECT

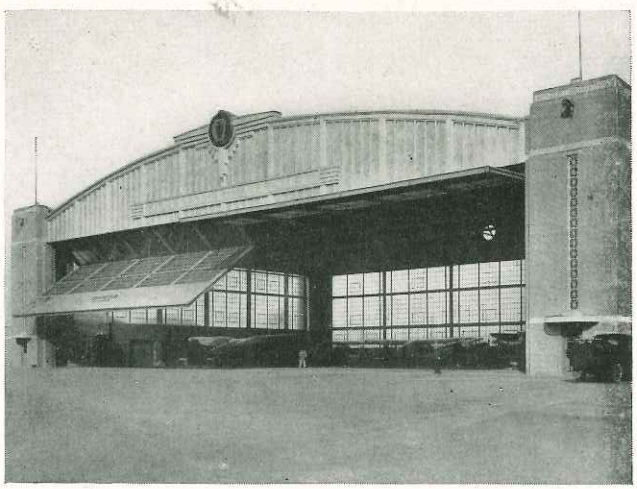


HORIZONTAL SECTION AT A-A

NOTE: ROLLER GUIDE CHANNELS AT THE JAMBS OF THE DOOR ARE NECESSARY TO KEEP THE LEAF IN ITS PROPER POSITION WHEN OPENING OR CLOSING ~

TRUSCON BRACED CANOPY STEEL HANGAR DOORS





The Braced Canopy Type Door is practically the same design as the Unbraced Door but can be used in openings up to and including 50′ high. With this door the clear opening width can be unlimited by dividing the door into sections, each of which is independently operated. It is recommended that no single section exceed 120′ in width. The system of bracing used on the inside of the door transmits the wind load from the face of the moving door to the structural frame overhead.

CONDENSED SPECIFICATIONS

1. General — All doors shown on the drawings shall be of the Braced Canopy Type Door as manufactured by Truscon Steel Company, Youngstown, Ohio. No substitution shall be made without the written consent and approval of the architect.

2. Scope of Work — The door manufacturer shall furnish the doors complete with counterweights and operating mechanism, electric motors and controls. Collateral steel, such as cable sheaves and track supports, counter-weight supports and towers, also catwalk, to be furnished by structural steel contractor.

3. Construction — (a). The doors shall be constructed of hot rolled shapes, steel panels of 13 ga. roller leveled sheets and steel sash. Sash and panels to be bedded in mastic and attached to frame members with machine screws.

(b). Doors shall operate in two equal sections. Door facing of each section shall be divided horizontally into not more than two leaves both of which act simultaneously. Door facing shall be reinforced by vertical structural posts spaced as indicated on plans. The vertical posts shall be reinforced by movable structural steel work overhead.

(c). Corners shall be miter cut or coped or butted, reinforced and welded in such a manner that the weld will develop the full strength of sections; weld shall be ground smooth on exposed surfaces.

(d). The upper portion of the door shall be filled with sash sections of Truscon standard members. Steel sash shall be hot rolled sections designed for inside glazing.

(e). Pilot doors, made from 1¾″ x 5″ x 16 ga. pressed or rolled tubing with butted corners full welded and finished smooth shall be fitted into the main doors where shown on the drawings.

4. Operating Mechanism — (a). The operating mechanism shall be of the positive drive type, driven and controlled by electrical devices. It shall be mounted on steel supports framed in with the structural portion of the building.

(b). The door leaves will be suspended in the opening by a series of short equal length cables which have a safety factor of at least 5 to 1 over the combined dead load, 25% impact and wind load. They shall operate over cast iron sheaves which are mounted on pressure lubricated precision type ball or roller bearings.

(c). The lifting cables from the door shall be driven by a positive drive mechanism, which shall carry the combined loads to one side of the door opening. At this point they shall be connected to a counterweight equivalent to the dead weight of the door by multiple cable suspension.

(d). Drum type control stations shall be located at each jamb, two interiors for each section of the door, all located 4′ 6″ above the floor.

(e). Doors shall be equipped with auxiliary hand-operating device. An electric interlock shall be provided between the hand operator and motor control panel, making it impossible to energize the motor when the hand operator is engaged.

5. Weathering — Weathering shall be as effective as possible. Where practical, flat metal to metal surface contact shall be provided. The door in a closed position shall fit snugly to the building construction at head and sill and clearance apertures shall be tightly sealed. Provision shall be made for expansion and contraction of the structural members and the possibility of building settlement.

6. Hardware — Head and sill shall have fully automatic locking device which shall secure the door positively in closed position, against both internal and external wind pressures. Locking devices shall engage automatically with the mechanical operation of the door.

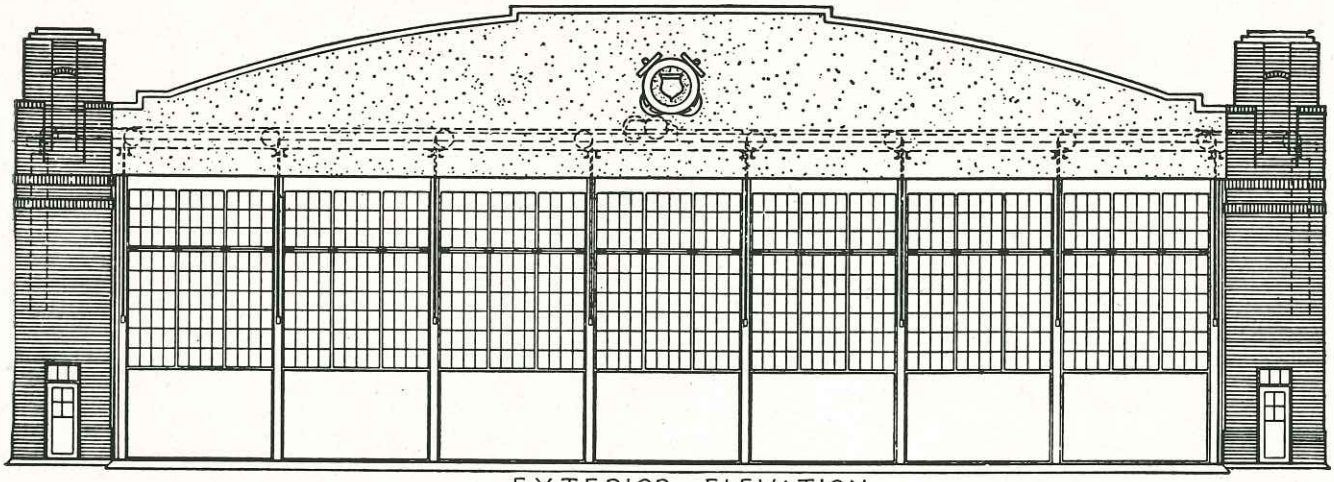
7. Design Data — The doors shall be designed to withstand not less than 20 lbs. per sq. ft. internal or external wind pressure when the door is in its closed position and 10 lbs. per sq. ft. in any open position, limiting the fibre stresses due to wind loads to 27,000 lbs. per sq. in. Deflection in any member shall not be greater than 1/120th of the span.

8. Erection — The erection of the door and operating equipment to be done by the door manufacturer. He shall also set and adjust limit switches, magnetic brake, motors, etc. The electrical contractor shall furnish all conduit, wire and do all the necessary wiring between the motors, control panels and switches. He shall furnish fused type safety switch of the proper capacity on the feed lines ahead of each reversing panel.

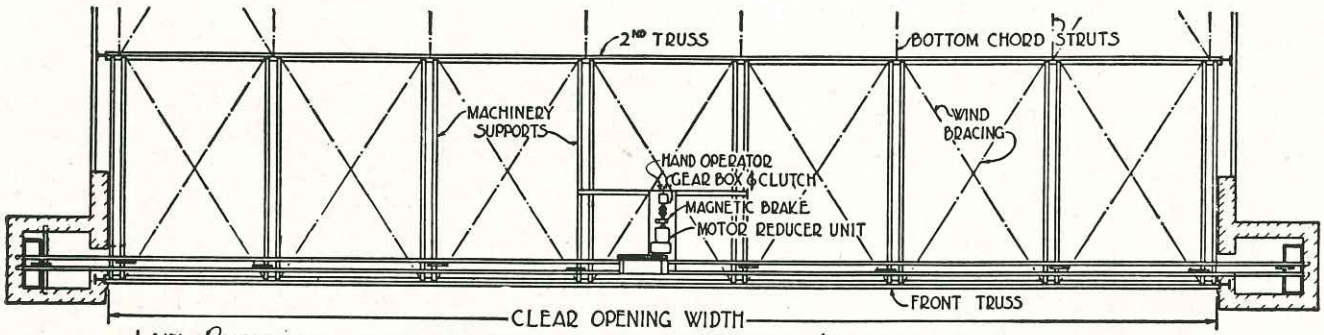
9. Shop Painting — All panels and structural work shall be given a shop coat of the manufacturer's standard metallic primer before shipment. The operating machinery shall be painted with one coat of gray enamel.

TRUSCON BRACED CANOPY STEEL HANGAR DOORS

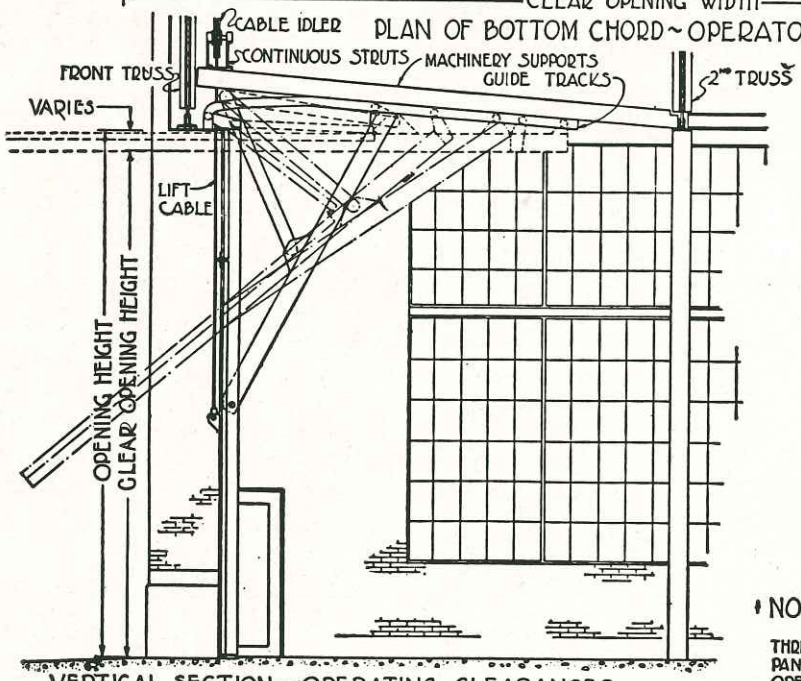
ELEVATION AND CONSTRUCTION DETAILS



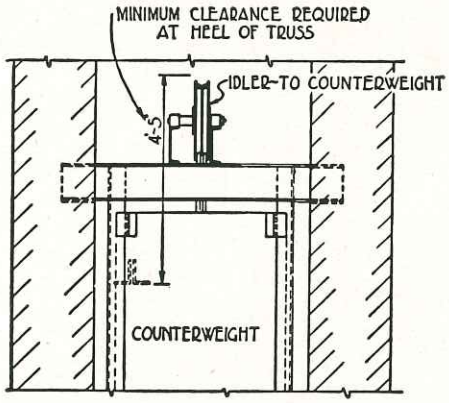
EXTERIOR ELEVATION



PLAN OF BOTTOM CHORD ~ OPERATOR & WEIGHT BOXES



VERTICAL SECTION ~ OPERATING CLEARANCES



VERTICAL SECTION THRU TOWER
SHOWING WEIGHT BOX

NOTE:
DOOR MOVEMENT IS CONTROLLED BY LIMIT SWITCHES. THREE BUTTON CONTROL STATION AND REVERSING RELAY PANEL ARE LOCATED ON SIDEWALL ADJACENT TO JAMB OF OPENING, EXACT LOCATION TO BE DETERMINED BY ARCHITECT.

TRUSCON VERTICAL LIFT CANOPY STEEL HANGAR DOORS

The Truscon Vertical Lift Canopy Door is of structural frame design divided horizontally in two sections or leaves, the upper leaf hinged, near the top, to the supporting steel with heavy hinge pin castings, and the lower leaf arranged to slide up and in back of the upper leaf. In operation the lower leaf is raised vertically, by means of cables, to approximately one-half the opening height, at which point both leaves tilt outward so as to form a canopy in the extreme open position. No portion of the door encroaches on the storage space within nor on the apron space outside the building. This is particularly important since it is impossible for anyone operating the controls on the inside of the building to see any obstruction on the apron outside.

Cables Protected

All supporting cables are protected from exposure to the weather by being located on the inside of the building, resulting in long life and economical maintenance.

Minimum Counterweights

The lower leaf of the door only is counterweighted so that the load on the cables is approximately one-half the total load of the door and a minimum of counterweights is required.

Conservation of Heat

Normally, only a portion of the extreme door height is required and frequently this can be obtained by raising only the bottom leaf. This feature is of utmost importance when conservation of heat, within the building, is desired.

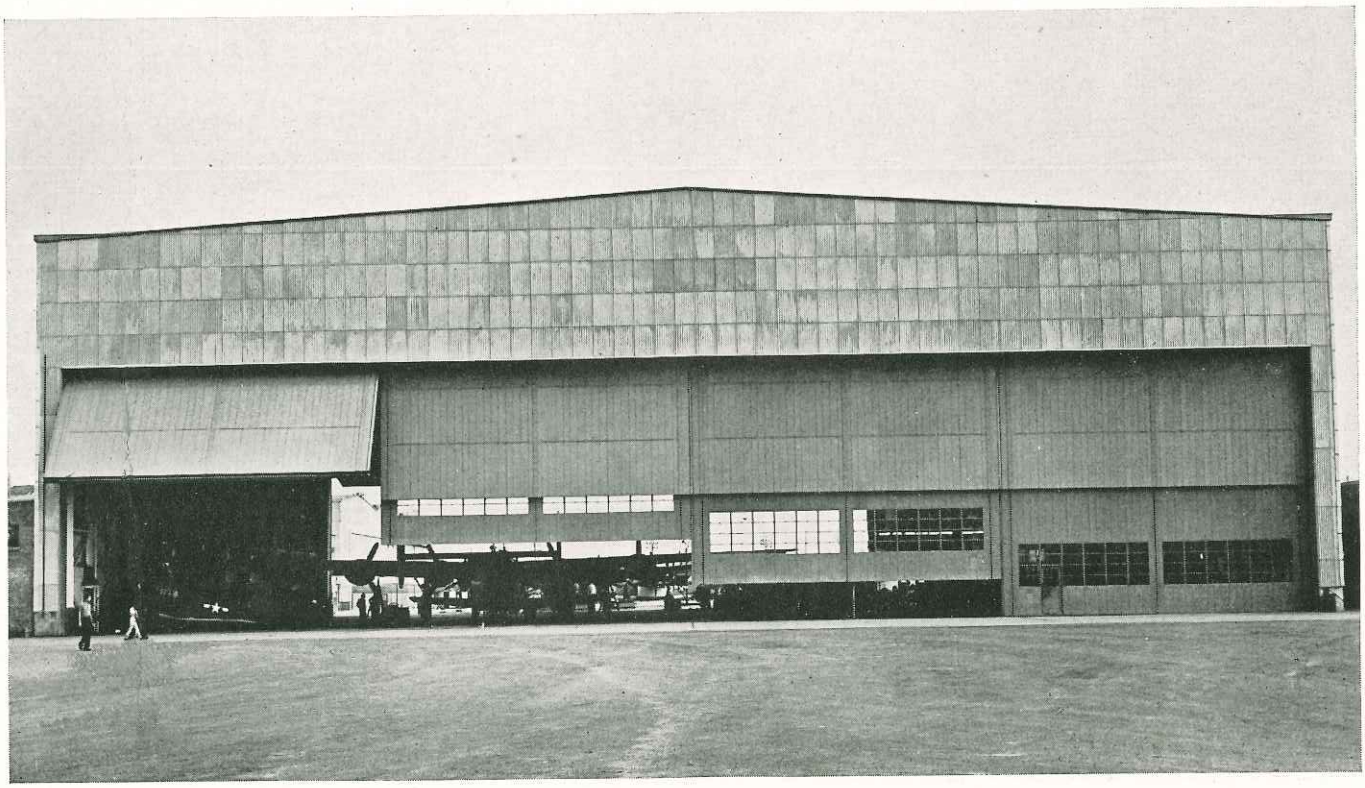
For All Sizes of Openings

The Truscon Vertical Lift Canopy Hangar Door can be built to extreme heights and widths, in as many individually-operated sections as desired, without posts of any kind between the sections.

Design Service

In the following paragraph we give you weight information with which you can estimate your approximate supporting steel requirements. However, these figures are only estimates and when exact information is required a Truscon Door engineer is available to work with you.

Doors specified on page 21 and shown in detail on pages 22 and 23 will weigh from ten (10) to fourteen (14) pounds per square foot. Supporting steel should be designed for door load plus 20% impact plus wind at five (5) pounds per square foot of door area.



Truscon Vertical Lift Canopy Doors. Goodyear Aircraft Corp., Litchfield Park, Arizona
Door opening 195'-0" x 40'-0" in four operated sections

TRUSCON VERTICAL LIFT CANOPY STEEL DOORS
SPECIFICATIONS

1. Scope — (a). Work included under this heading shall consist of the furnishing of the Vertical Lift Canopy Hangar Doors complete with all operating mechanism, electric motors and controls, all counterweights and their installation as herein specified.

(b). Work not included under this heading consists of:

(1) All supporting steel such as sheave channels, bottom chord strut channels, hinge pin plates, catwalk and bearing support plates, counterweight tower, guides, and enclosures, floor curb angle, jamb plates, soffit angle and soffit plate.

(2) Wiring of electrical equipment including conduit, wire and wiring devices, and safety switches.

(3) Glass, putty, glazing and field painting.

2. Type of Door — Each of the door operating sections is divided horizontally into a top and bottom leaf of approximately the same height. When opening, the bottom leaf is to slide vertically upward behind the top leaf to a height approximately three feet less than the height of the bottom leaf, and from this position both leaves swing out and up to form a canopy in front of the door openings. Each of the door sections shall operate from a single source of power supply and be perfectly counter-balanced in all of its opening positions. No portion of the door is allowed to encroach upon the storage space inside of the hangar when opening or closing, or on the outside below the top leaf, thus providing high clearance line both inside and outside.

Doors shall be so designed that if only a partial opening is required, top half of door shall remain in its closed position so that the heat loss shall be kept to a minimum. Special consideration will be given to the door providing the least amount of heat loss when the door is in a partial open position.

3. General Information for Bidder — Bidder shall advise the architect at once, in writing, of any changes or revisions required by him for the satisfactory installation of these doors. He shall also provide the information necessary for the setting, drilling and fastening by others of all work to be furnished by him.

4. Design Data — Doors shall be constructed of hot rolled steel or formed sections of such sizes and shapes as to withstand a wind pressure of 15 pounds per square foot when in a closed position and 5 pounds per square foot in any operating position, without exceeding the fiber stresses herein given, and without the main supporting members deflecting in excess of 1/120 of the span. Fiber stresses in main door members, due to dead loads, and impact, shall be limited to 24,000 pounds per square inch. Impact allowance shall be not less than 20 percent of the dead load. Stresses in main members due to wind shall be limited to 27,000 pounds per square inch.

Steel members and panels or sections of convenient sizes of practical handling shall be shop fabricated with suitable joints for field assembly.

5. Panels — The door facing shall consist of not less than 13 gauge roller level steel plates, and steel sash constructed of solid rolled sections. The plates and sash shall be set in mastic and attached to the panels in the shop. Plates and sash to be held in place by RHMS. All jointing of steel panels and sash shall be done in such a manner that when the work is complete, it shall present a covering that will be thoroughly weatherproof.

The steel sash shall be arranged for outside putty glazing with four spring glazing clips provided for each light.

6. Pilot Doors — Pilot doors shall be provided in accordance with the design and location indicated on the architectural drawings. Pilot door tubing shall be constructed of 16 gauge steel to a thickness of not less than 1¾".

Doors shall be hung with 1½ pair of 5" x 5" half surface steel template butts. Lock shall be an approved mortised type with iron handles and escutcheons on each side of the doors, on outside, cylinder; inside, thumb turn, latch and dead bolt. Cylinders shall be master-keyed with similar cylinders of the doors in the rest of the building.

7. Construction — (a). **Arms.** The top leaf of each door section shall be supported by adequate wide flange beams securely pivoted to the structural work of the building. Provisions shall be made on these beams or arms to receive the sliding portion of the bottom leaf of the door. The pivots shall be constructed of cold rolled pins and operate on oilite bronze bearings. The mountings for the pins (hinge pin plates) to structural work of the building shall be such that they may be adjusted both vertically and laterally to suit any variation of the steel work.

(b). **Slides.** Each of the slides on the bottom leaf of the door shall be constructed of adequate steel members framed together with a plate. They shall extend above the bottom leaf so as to have sufficient lap on the arms above. The rollers are to have oilite bearings and mounted on cold rolled pins. The front of the slides shall be fitted with adjustable steel weather plates.

8. Weather Protection — Weather strips of 2-ply duck inserted packing shall be fitted to the doors between the top and bottom leaves, and at the sill; 1-ply duck inserted packing to be used at the jambs of the door opening, and between the two operating sections, and metal weathering at the head of the door.

9. Mechanical Operators — (a). The **operating mechanism** shall be of such a design as to keep the doors in perfect balance and strong enough to open the doors under the specified wind load. The lifting and swinging movements of the doors are to be accomplished with a system of cables operating over drums and sheaves. This system is duplicated at each arm in such a manner that all the cables attaching to the doors will be of the same lengths. These cables will be made of plow steel, 6 strands 37 wires, and run on drums and sheaves of cast steel or mechanite with finished grooves. They shall have a self-lubricating hemp core, and shall have a safety factor of not less than 5 to 1.

(b). The **Sheaves** shall be mounted on oilite bearings and fitted with pressure type grease tips.

(c). **Cables** from the doors shall be moved by a series of drums on a line shaft. This shaft shall be continuous for the width of the operating section and shall be adjustable. Bearings for the shaft shall be oilite fitted with pressure grease tips.

(d). **Counterweights** are to be designed so as the size will fit into locations indicated on the architectural drawings. Provide equalizers above the counterweights to insure equal load on each of the supporting cables.

10. Motor Drive — The operating line shaft shall be driven from a totally enclosed reduction gear by a standard roller chain drive. The reduction gear, high starting torque motor, magnetic brake and hand operator and releases are to be mounted in a self-contained unit. This unit shall be equipped with an emergency hand operator that can be operated from catwalk at the power unit.

The motor operators shall be placed at the approximate center of each operating section directly over the door openings.

An electric interlock shall be provided between the hand operator and the motor control, making it impossible to energize the motor when hand operator is engaged.

11. Motors — The motors for each operating section shall be high starting torque hoist type motors. The doors shall operate at a speed of approximately 30 vertical feet a minute.

12. Electrical Controls — Each operating section shall be controlled by a drum type station, placed inside of the building. The controls shall be of the constant pressure type, plainly marked "Open" and "Close".

Two limit switches shall be mounted in series on the door in such a way as to stop the doors in fully open and closed positions. Also provide safety switches in top and bottom of counterweight tower. The magnetic reversing panel shall be of 3 pole unit, with thermal relays and anti-plug delay relays enclosed in a steel box with a hinged cover.

13. Electric Wiring — The contractor for electric wiring shall bring feed wires from power panel to each door motor, where he shall install a safety type fused disconnect switch of proper capacity. He shall do all wiring between switches and control panels and make service connections as required by the door contractor for testing.

All wiring shall be according to the door contractor's wiring diagram and shall conform to all national and local codes and requirements.

14. Floor Bolts — Automatic floor bolts that lock the doors to the floor at the bottom of each side of the bottom leaf shall be furnished with the doors. Floor plates shall also be furnished with the doors, but shall be set by others according to layout drawings furnished with the doors.

15. Catwalk — Catwalk is to be continuous for the entire length of the door opening and is to consist of ribbed plate supported on steel members and is to have an angle iron railing, consisting of one horizontal angle and a bar and vertical angles. **This item to be covered under heading of structural steel.**

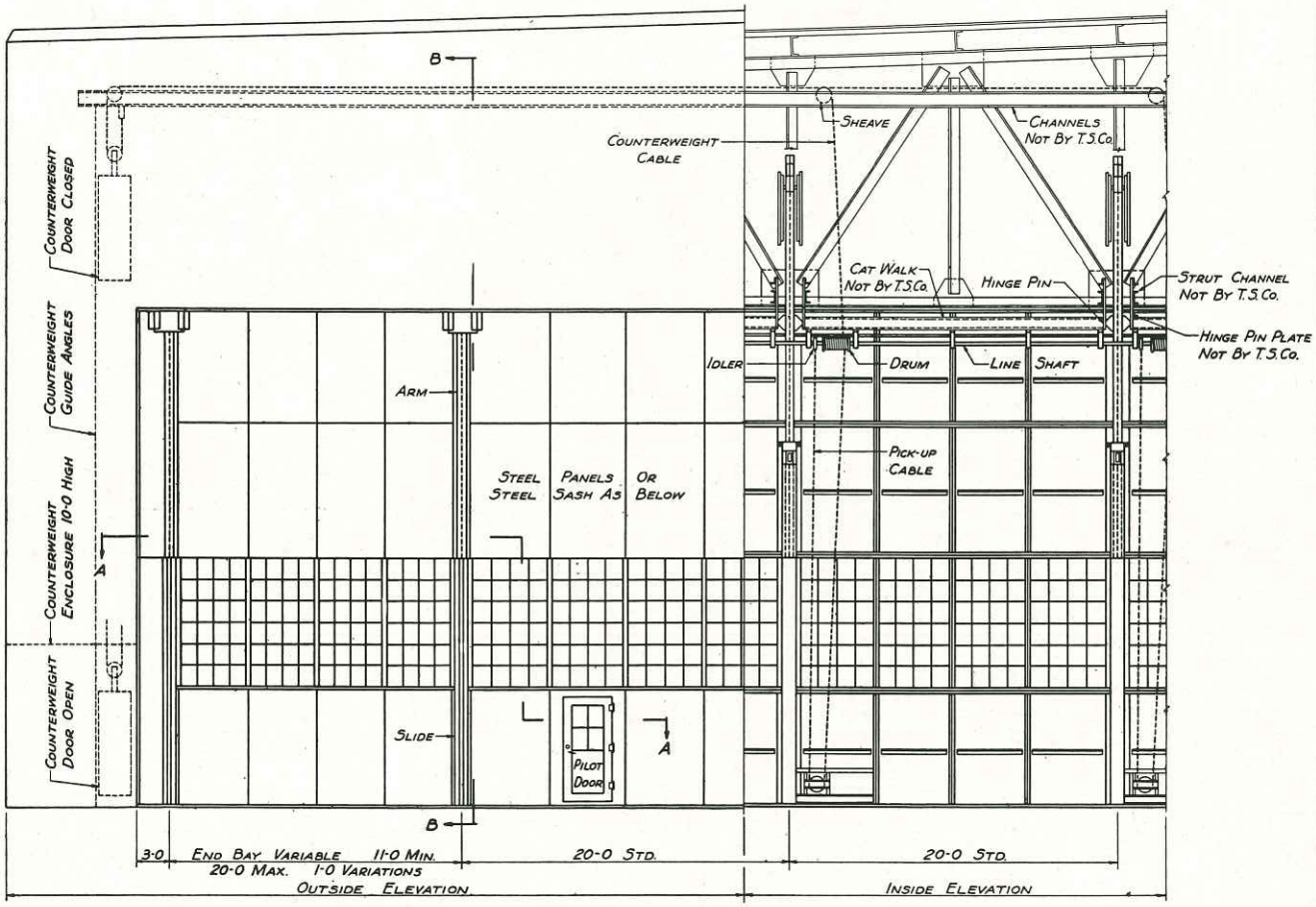
16. Painting — Doors shall be given one sprayed-on coat of metallic primer, before shipment. Hardware and machinery shall be finished with gray machinery enamel at factory.

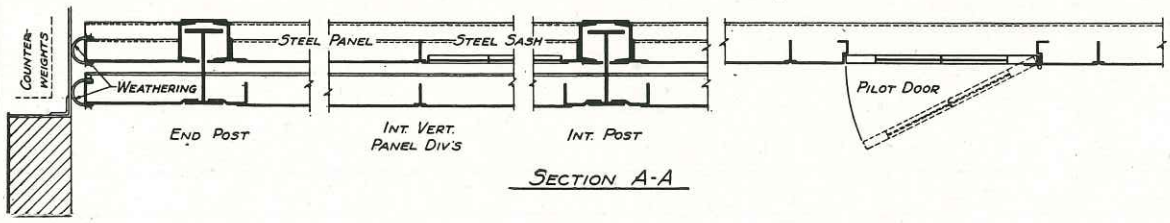
17. Guarantee — Contractor to furnish guarantee against all defects in material and workmanship for a period of 1 year. Replacement of cables due to ordinary wear to be done by owner.

TRUSCON VERTICAL LIFT CANOPY STEEL DOORS

CONSTRUCTION DETAILS

Plan Of Counterweight Sheave Channels





Section A-A

TRUSCON VERTICAL LIFT CANOPY STEEL DOORS

CONSTRUCTION DETAILS

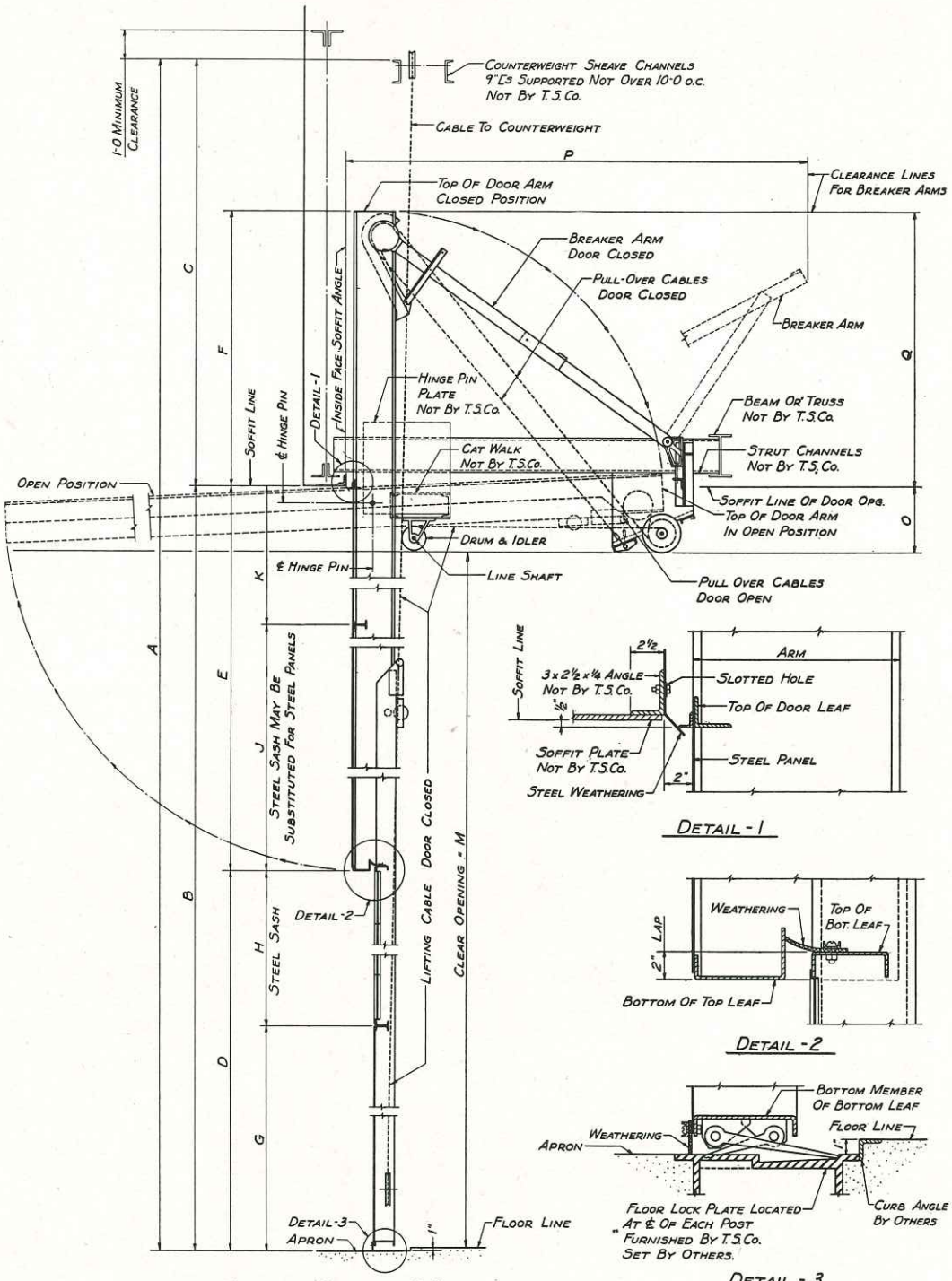
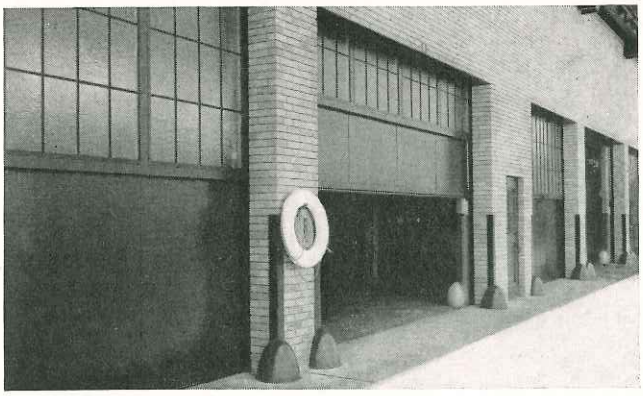


TABLE OF DIMENSIONS														
Opg. Ht.	A	B	C	D	E	F	G	H	J	K	M	O	P	Q
25'-0	35'-7½	25'-1	10'-6½	12'-0	13'-1	7'-4½	7'-1⅝	4'-10⅜	6'-7⅛	6'-5⅞	22'-7	2'-5	12'-0	8'-6
30'-0	41'-9½	30'-1	11'-8½	14'-6	15'-7	8'-6½	7'-1⅝	7'-4⅜	7'-6⅜	8'-0⅝	27'-7	2'-5	12'-9	8'-9
35'-0	47'-7½	35'-1	12'-6½	17'-0	18'-1	9'-4½	7'-1⅝	9'-10⅜	10'-0⅜	8'-0⅝	32'-5	2'-7	13'-7	9'-0
40'-0	52'-11½	40'-1	12'-10½	19'-6	20'-7	9'-8½	8'-0¼	11'-5¾	11'-7¾	8'-11¼	37'-0	3'-0	17'-4	10'-6
45'-0	59'-1½	45'-1	14'-0½	22'-0	23'-1	10'-10½	10'-6¼	11'-5¾	11'-7¾	11'-5¼	41'-10	3'-2	18'-6	10'-10

TRUSCON TWO-SECTION VERTICAL LIFT STEEL DOORS



This type consists of two leaves, each approximately one-half the opening height, sliding vertically upward in guideways attached to the jambs of the openings. The bottom leaf sets behind the plane of the top leaf and moves simultaneously with it but at twice the speed. The operating mechanism consists of a pair of cables running over a series of sheaves to a single counterweight balancing both leaves.

Clearance required above the lintel should be approximately one-half the door height, plus 22 in.

The meeting rail joint between the two leaves is effectively weathered. Rubber weathering can also be applied at the top and to the bottom rail.

SPECIFICATIONS

1. Scope of Work — The work to be included shall consist of furnishing at the site, the material, labor, and superintendence necessary to install complete, all Two-Section Vertical Lift Doors.

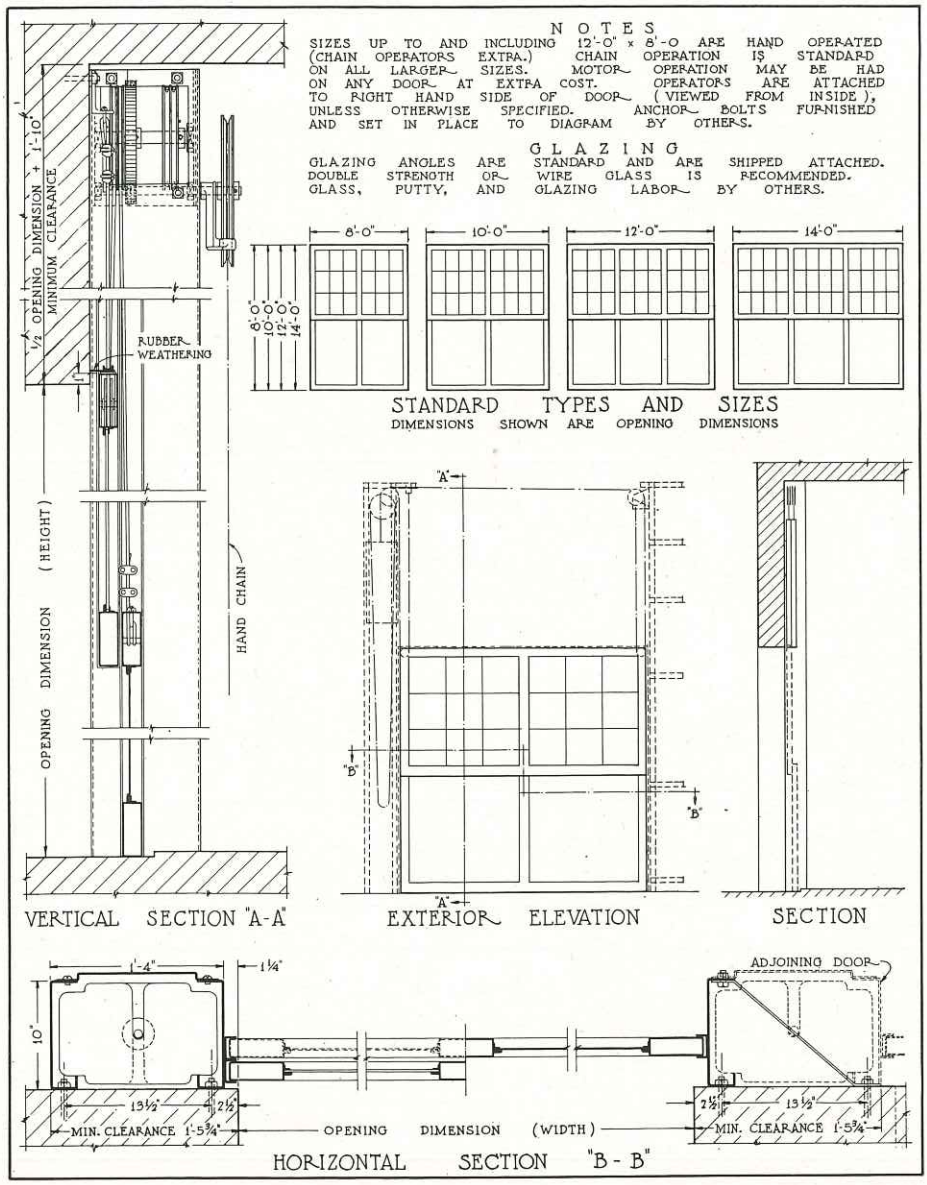
2. General — (a). All vertical lift doors shown on drawings shall be of tubular (or channel rail) design as manufactured by the Truscon Steel Company. (Maximum opening dimensions for tubular design is 14′ x 14′.)

(b). Each door shall be composed of a top and bottom leaf of equal dimensions.

(c). The bottom (inside) leaf shall rise vertically at approximately twice the speed of the top leaf. At full opening, the two leaves shall rest one in back of the other in a vertical position directly above and completely clear of the door opening.

(d). The operating mechanism shall be so designed that the leaves are perfectly balanced by counterweights in any operating position.

TUBULAR DESIGN



(d). The operating mechanism shall be so designed that the leaves are perfectly balanced by counterweights in any operating position.

3. Material — (a). All frame members, sheets, sash sections, guides, and counterweight enclosures shall be of hot-rolled new billet steel of the gauges and sizes shown on the drawing or hereafter called for in these specifications.

4. Construction — (a). The stiles and rails shall be constructed of either cold formed 1¾″ x 5″ x 16 gauge steel tubing or they shall be of 3″ channel structural shapes as determined by the size of the doors.

(b). All corners and intersections shall be welded and ground smooth on exposed surfaces of the door. Welds must develop the full strength of the section.

(c). The lower leaf of the door shall be fitted with No. 14 gauge roller leveled steel sheets. These sheets shall be set in mastic and for the Tubular Rail Doors shall be held in place by continuous steel retaining angles. For the Channel Rail Doors, these sheets shall be attached to the door frame with machine screws.

(d). The upper leaf of the door shall be fitted with steel sash furnished with continuous inside metal glazing strips for the Tubular Rail Doors, and with glazing clips for inside putty glazing for the Channel Rail design.

(e). The jamb plates which bolt to the inside face of the door opening shall be pressed steel channel shapes 10″ deep and not less than ⅛″ in thickness. The door leaves, guides, and operating mechanism are all supported from these jamb plates. The end counterweight enclosure shall be the same channel shape as the jamb plates and extend to the same height. The front cover of the counterweight enclosure shall be 16 gauge metal and 7′ 0″ high.

(Specifications continued on page 25)

SPECIFICATIONS (Continued)

5. Hardware and Operators — (a). Tubular Rail Doors up to and including 12′ 0″ in width and 9′ 0″ in height are to be manually operated by handles and a pull-down chain on the bottom leaf. Tubular Rail Doors over above dimensions and all Channel Rail Doors are to be mechanically operated by a continuous zinc coated hand chain, located inside the building at either jamb of the opening. The ratio of travel between hand chain and the door shall not exceed 6 to 1, and the pull on the hand chain must not exceed 25 lbs.

(b). The top corners of the bottom leaf shall be fitted with an adjustable cable connector for direct pickup. The top corners of the top leaf shall be fitted with idler wheels enclosed within the door. The two leaves shall be picked up separately by two (one cable for each leaf) 6-strand, 19 wire plough-steel cables, or equal, which run continuously to the counterweight from one corner of each leaf over cast iron sheaves mounted on ball bearings and thence back over sheaves to the opposite corner of each leaf. Independent adjustment is provided at the dead ends of each cable.

(c). The sectional counterweights shall be of cast iron with clear regular surfaces and weighing not more than 50 lbs. per section. They shall pile true on a center rod.

(d). The operator unit above the counterweights shall consist of a welded steel frame which bolts directly to the jamb plates. This frame shall support V-grooved cable sheaves of size not less than recommended by cable manufacturers. The cable sheaves shall be operated through a gear reducing unit to a hand chain wheel. All hand chain operated units shall also be equipped with the necessary provisions for electrification.

(e). Doors shall be locked by a throw bolt on the inside of the bottom leaf.

6. Electrical Operators — (a). All vertical lift doors, when noted on the drawings, shall be fitted with electric power drives of the fully automatic type, controlled from one or more push-button stations.

(b). These electric operators shall consist of a factory assembled unit attaching directly to the standard door operator as specified under Paragraph 5, Section (d). The electric motor shall be of the high starting torque, induction type, vertically mounted, with the right angle reducing gear built integral with the motor frame. The motor shall further be equipped with a multiple disc, built-in brake, acting on the motor shaft to stop and hold the door in any position when the current is off.

(c). The doors shall be controlled by a 3-button momentary contact push-button station (marked "open-close-stop") mounted inside the building at one jamb of the opening. Additional push-button control stations may be had at extra cost. The doors shall be automatically stopped in their fully open or fully closed positions by means of lever snap-type limit switches. Motor reversing control shall consist of a high quality combination reversing starter and throw-out switch. The door manufacturer will assemble and wire the complete unit in the shop before shipment to the job. The general wiring contractor shall bring the main supply wires to a point adjacent to the motor equipment and complete the wiring in accordance with wiring diagram in the control cabinet.

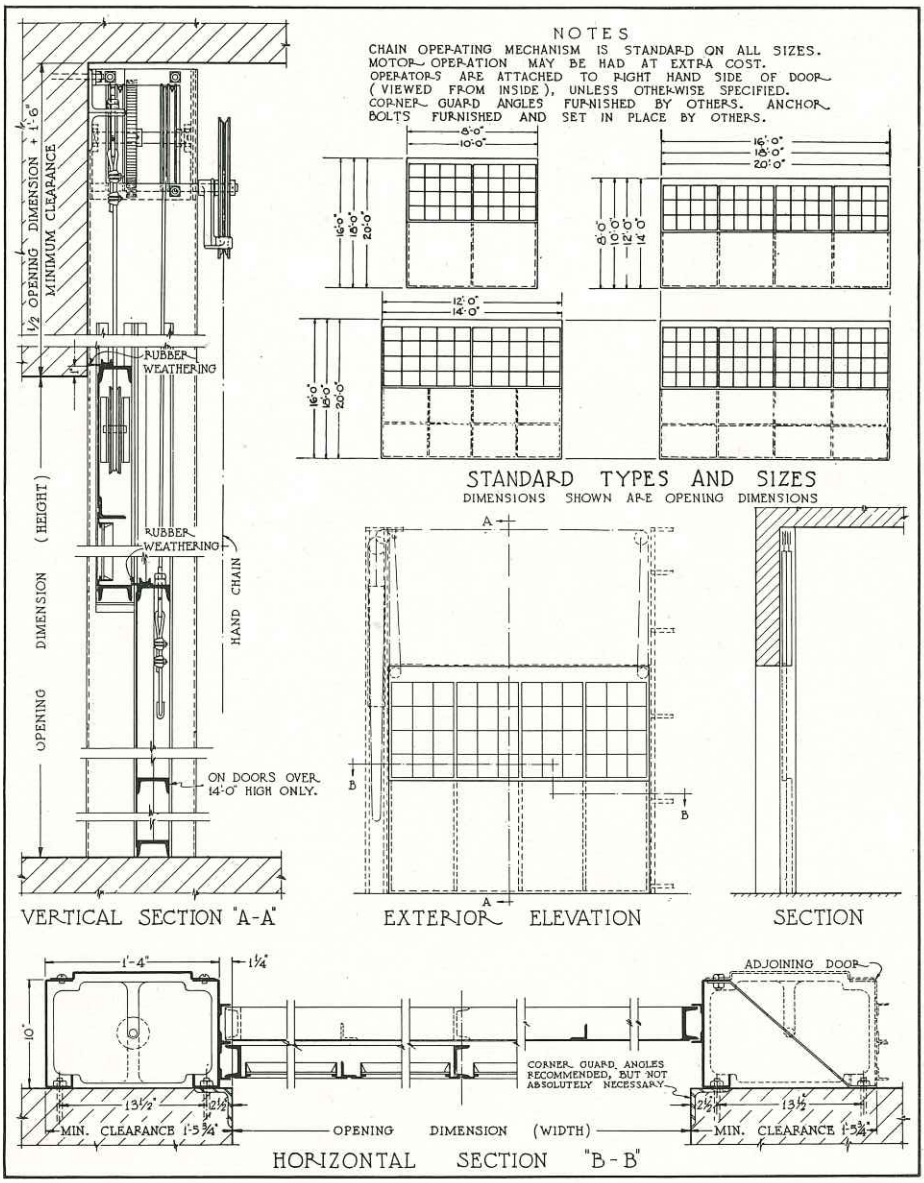
7. Shop Painting — (a). Before shipment all leaves, guides, and the weight boxes shall be given a coat of gray metallic primer paint. The machinery shall be painted with one coat of gray enamel. No field painting is included under this specification.

8. Erection — The erection of the door and operating equipment is to be in strict accordance with instructions shipped with the door and shall be done by the door manufacturer.

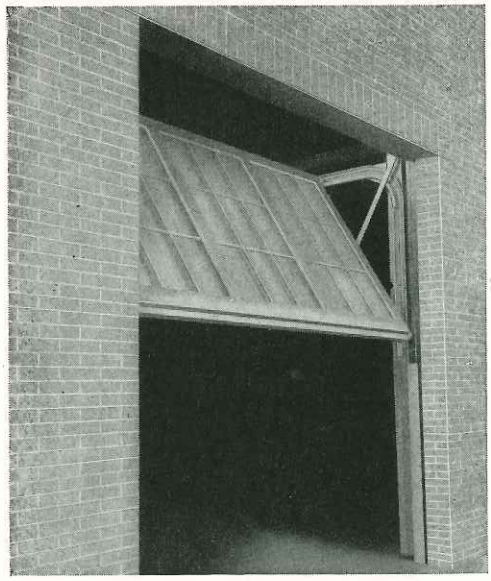
(b). The building contractor shall furnish and set the anchor bolts necessary to install the door in accordance with the diagram furnished by door manufacturer.

9. Glazing — (a). The glass, putty, and glazing are to be furnished by the glazing contractor after the door has been completely erected.

STRUCTURAL DESIGN



TRUSCON TWO-SECTION TURNOVER STEEL DOORS



Designed for rapid operation, Truscon Two-Section Turnover Doors are effective barriers to infiltration of cold air and resultant heat loss in industrial buildings of all types.

These weathertight steel doors, of unusually heavy construction, have two leaves, counterweighted in any position in the complete "door cycle" from fully closed to fully open. This permits easy manual control at all times.

When the door opens, the bottom leaf slides upward vertically until it lies parallel to and behind the top leaf. Then both leaves move together, **turning over,** so that their outside surfaces are upward when they reach the horizontal position.

An important advantage is the reduced clearance required inside the building for opening and closing these doors. This design affords minimum interior clearance at any point in door cycle.

SPECIFICATIONS

1. Scope of Work — The work to be included shall consist of furnishing at the site, the material, labor, and superintendence, necessary to install complete, all Two-Section Turnover Doors.

2. General — (a). All turnover doors shown on the drawings shall be of the tubular (or channel rail) design as manufactured by Truscon Steel Company. (Maximum opening dimensions for tubular design is 14′ x 14′.)

(b). Each door shall be composed of a top and bottom leaf of equal dimensions.

(c). The bottom leaf shall be arranged to slide vertically upward until it is directly opposite and behind the top leaf. Both leaves then act together, turning over in such a manner that in their "full open" position, they lie horizontally directly behind the door header.

(d). In its closed position, the top leaf shall be suspended by a link mechanism at each jamb designed to give this leaf a definite connection to the building structure. It shall further be held against the door header by spring acting bolts.

(e). The operating mechanism shall be so designed, that the leaves are perfectly balanced by the counterweights in any operating position.

3. Material — (a). All frame members, sheets, sash sections, guides and counterweight enclosures shall be of hot-rolled new billet steel of the gauges and sizes shown on the drawings or hereafter called for in these specifications.

4. Construction — (a). The stiles and rails shall be constructed of either cold formed 1¾″ x 5″ x 16 gauge steel tubing or they shall be of 4″ channel structural shapes as determined by the size of the doors.

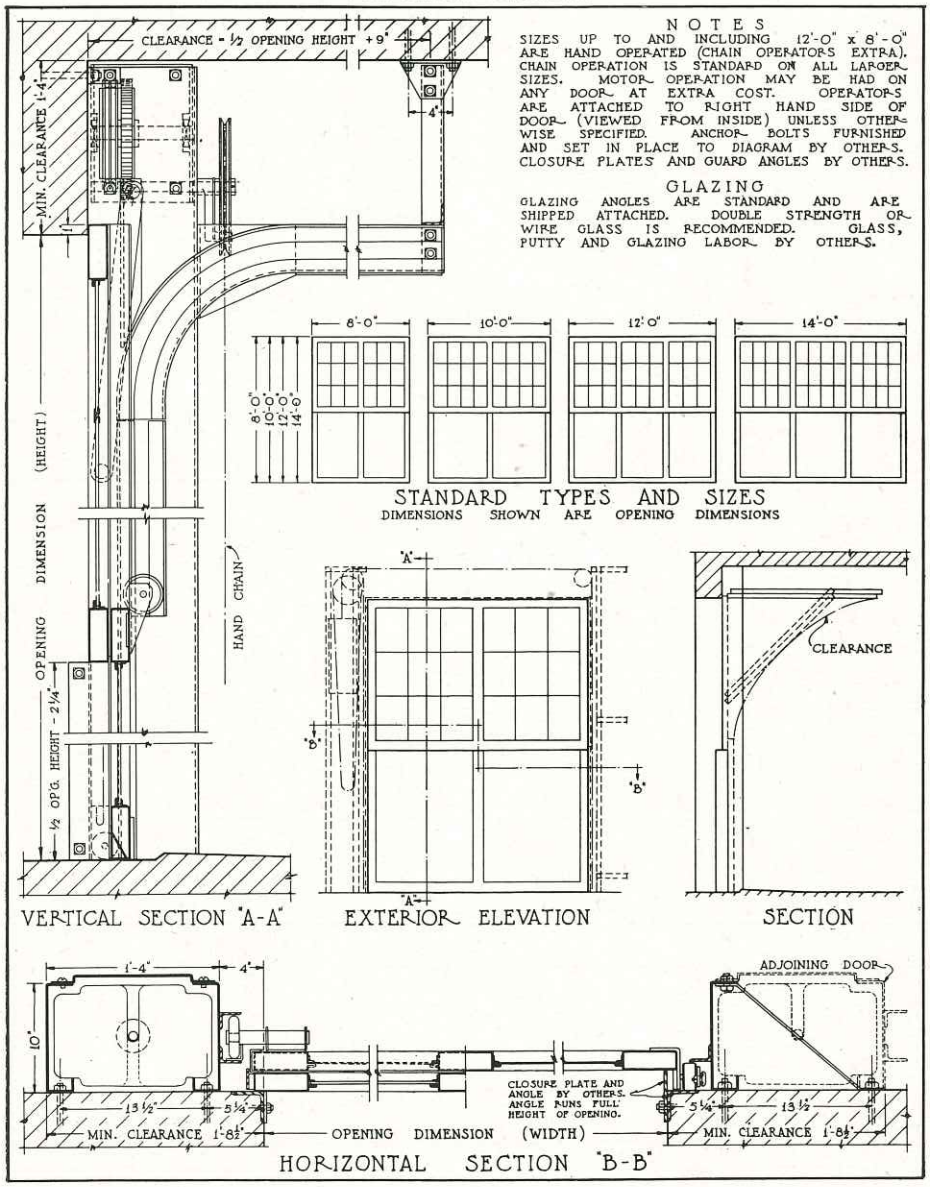
(b). All corners and intersections shall be welded and ground smooth on exposed surfaces of the door. Welds must develop the full strength of the section.

(c). The lower leaf of the door shall be fitted with 14 gauge roller leveled steel sheets. These sheets shall be set in mastic, and for the Tubular Rail Doors shall be held in place by continuous steel retaining angles; for the Channel Rail Doors, these sheets shall be machine screwed to the door frame.

(d). The upper leaf of the door shall be fitted with steel sash furnished with continuous inside metal glazing strips for the Tubular Rail Doors, and with glazing clips for outside putty glazing for the Channel Rail design.

(Specifications continued on page 27)

TUBULAR DESIGN



SPECIFICATIONS (Continued)

(e). The jamb plates which bolt to the inside face of the door opening shall be pressed steel channel shapes 10″ deep and not less than ⅛″ in thickness. The door leaves, guides, and operating mechanism are all supported from these jamb plates. The end counterweight enclosure shall be the same channel shape as the jamb plates and extend to the same height. The front cover of the counterweight enclosure shall be 16 gauge metal and 7′ 0″ high. The outside weather plates below the bottom leaf at each jamb are part of the door frame and are to be furnished with it by the structural steel contractor.

5. Hardware and Operators — (a). Tubular Rail Doors up to and including 12′ 0″ in width and 9′ 0″ in height are to be manually operated by handles and a pull-down chain on the bottom leaf. Tubular Rail Doors over above dimensions and all Channel Rail Doors are to be mechanically operated by a continuous zinc coated hand chain, located inside the building at either jamb of the opening. The ratio of the travel between hand chain and the door shall not exceed 6 to 1 and the pull on the hand chain must not exceed 25 lbs.

(b). The top corners of the bottom leaf shall be fitted with adjustable 4″ diameter rollers mounted on anti-friction bearings. The bottom corners shall be fitted with graphite bronze-bushed steel rollers attached by a rolled steel bracket fastened to the leaf. One 6-strand, 19 wire plough-steel cable, or equal, shall be attached to each of these brackets and run continuously over cast iron sheaves mounted on ball bearings to the counterweight. At the counterweight the cables shall return around a double grooved ball-bearing sheave to an upper suspension point, where independent adjustment shall be provided for each cable. The sectional counterweights shall be of cast iron with clean regular surfaces and weighing not more than 50 lbs. per section. They shall pile true on a center rod.

(c). The operator unit above the counterweights shall consist of a welded steel frame which bolts directly to the jamb plate. This frame shall support V-grooved cable sheaves of size not less than recommended by cable manufacturers. The cable sheaves shall be operated through a gear reducing unit to a hand chain wheel. All hand chain operated units shall also be equipped with the necessary provisions for electrification.

(d). Doors shall be locked by a throw bolt on the inside of the bottom leaf.

6. Electrical Operators—(a). All turnover doors, when noted on the drawings, shall be fitted with electric power drives of the fully automatic type, controlled from one or more push-button stations.

(b). These electric operators shall consist of a factory assembled unit attaching directly to the standard door operator as specified under Paragraph 5, Section (c). The electric motor shall be of the high starting torque, induction type, vertically mounted, with the right angle reducing gear built integral with the motor frame. The motor shall further be equipped with a multiple disc, built-in brake, acting on the motor shaft to stop and hold the door in any position when the current is off.

(c). The doors shall be controlled by a 3-button momentary contact push-button station (marked "open-close-stop") mounted inside the building and at one jamb of the opening. Additional push-button control stations may be had at extra cost. The doors shall be automatically stopped in their fully open or fully closed positions by means of lever operated snap-type limit switches. Motor reversing control shall consist of a high quality combination reversing starter and throwout switch. The door manufacturer will assemble and wire the complete unit in the shop before shipment to the job. The general wiring contractor shall bring the main supply wires to a point adjacent to the motor equipment and complete the wiring in accordance with wiring diagram in the control cabinet.

7. Shop Painting — (a). Before shipment all leaves, guides, and the weight boxes shall be given a coat of gray metallic primer paint. The machinery shall be painted with one coat of gray enamel. No field painting is included under this specification.

8. Erection — (a). The erection of the door and operating equipment is to be in strict accordance with instructions shipped with the door and shall be done by the door manufacturer.

(b). The building contractor shall furnish and set the anchor bolts necessary to install the door in accordance with the diagram furnished by the door manufacturer.

9. Glazing — (a). The glass, putty, and glazing are to be furnished by the glazing contractor after the door has been completely erected.

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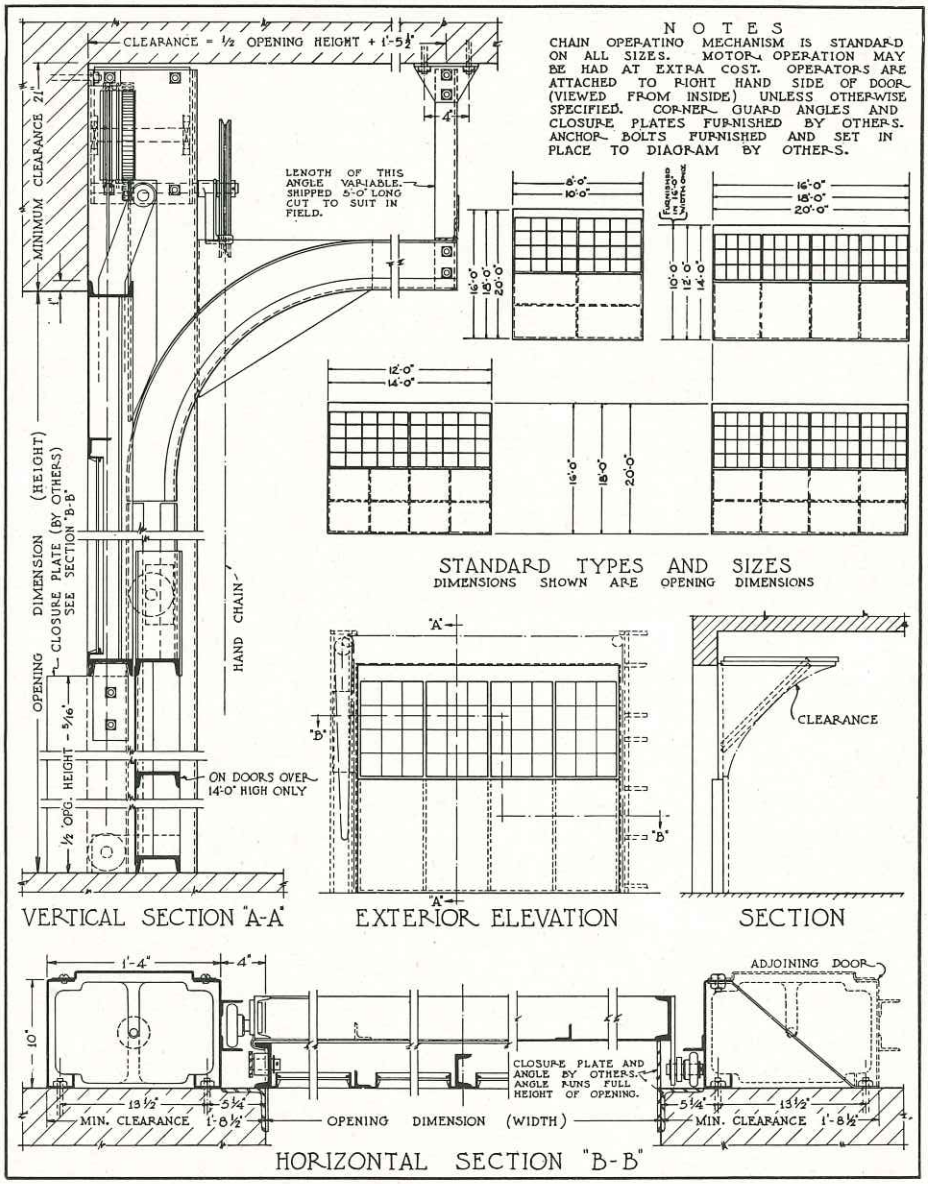
DESIGN DIVISION

STRUCTURAL DESIGN

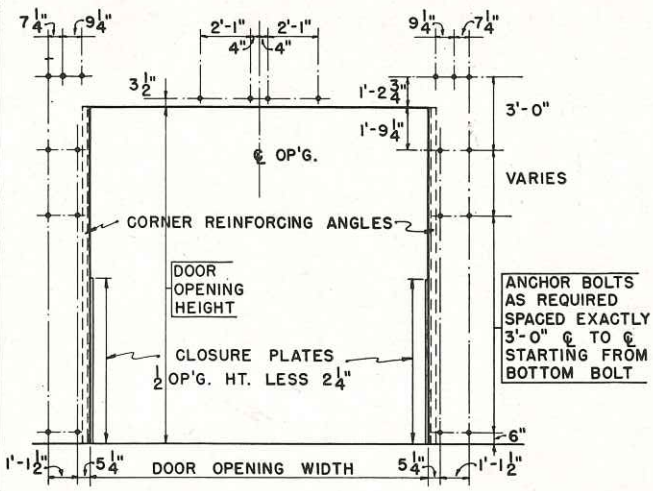


TRUSCON TWO-SECTION VERTICAL LIFT AND TURNOVER DOORS

ANCHOR BOLT DETAILS

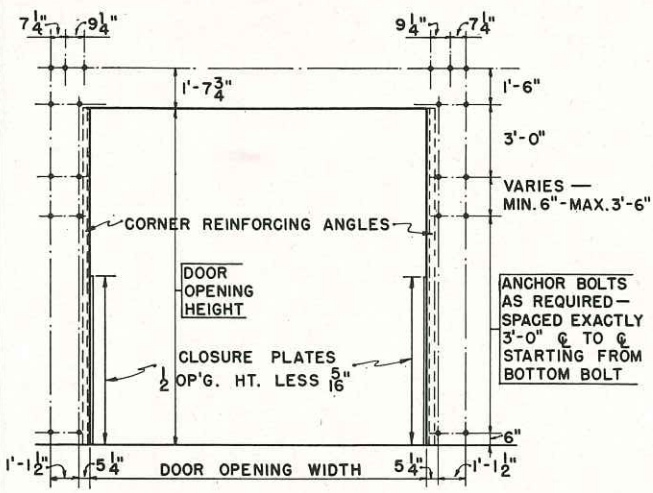
ANCHOR BOLT DIAGRAM FOR TURNOVER DOORS

TUBULAR TYPE



INSIDE ELEVATION

CHANNEL TYPE



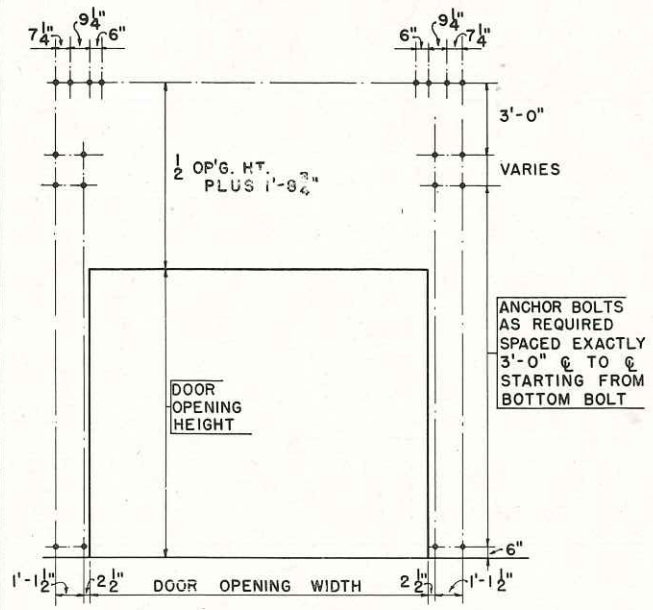
INSIDE ELEVATION

NOTES

- ALL ANCHOR BOLTS TO BE ½" DIAMETER AND TO PROJECT 1⅛" FROM INSIDE FACE OF WALL.
- CUSTOMER TO FURNISH AND INSTALL ANCHOR BOLTS SECURELY AND ACCURATELY.
- WALLS MUST BE PLUMB AND OPENINGS MUST BE TRUE AND SQUARE.
- CLOSURE PLATES ARE NOT FURNISHED OR INSTALLED BY TRUSCON STEEL CO.
- CORNER REINFORCING ANGLES MUST RUN FULL HEIGHT OF OPENING. THESE ANGLES ARE NOT FURNISHED OR INSTALLED BY TRUSCON STEEL CO.

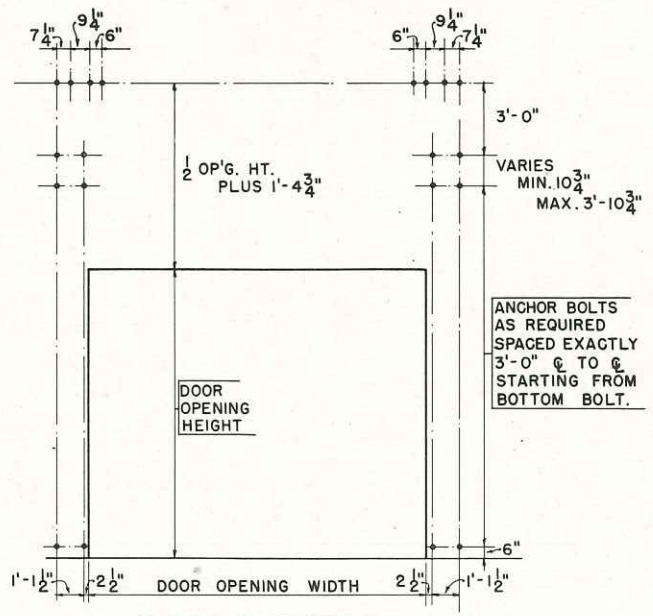
ANCHOR BOLT DIAGRAM FOR VERTICAL LIFT DOORS

TUBULAR TYPE



INSIDE ELEVATION

CHANNEL TYPE

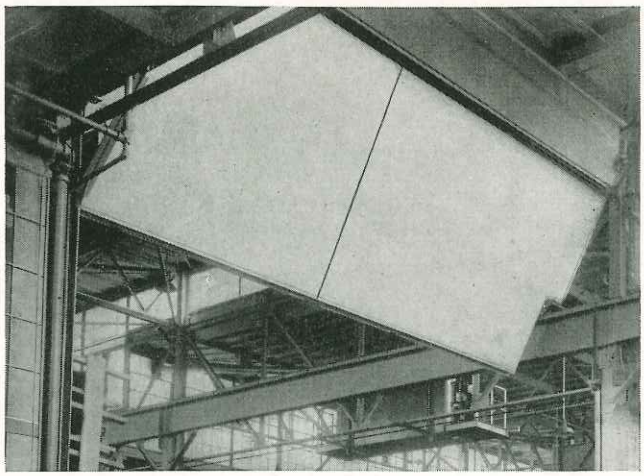


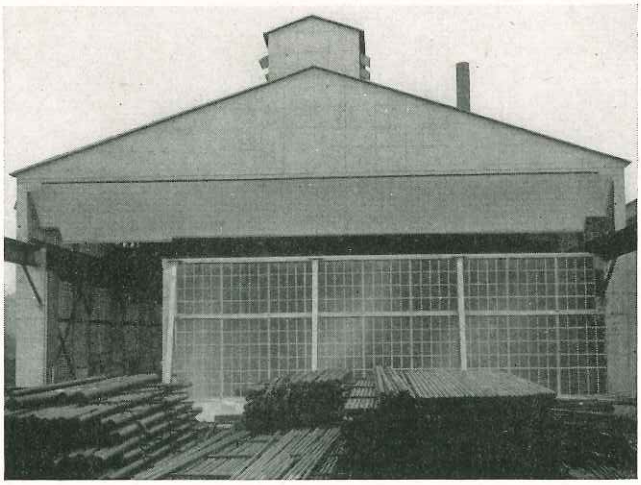
INSIDE ELEVATION

NOTES

- ALL ANCHOR BOLTS TO BE ½" DIAMETER AND TO PROJECT 1⅛" FROM INSIDE FACE OF WALL.
- CUSTOMER TO FURNISH AND INSTALL ANCHOR BOLTS SECURELY AND ACCURATELY.
- WALLS MUST BE PLUMB AND OPENINGS MUST BE TRUE AND SQUARE.

TRUSCON STEEL CRANE DOORS



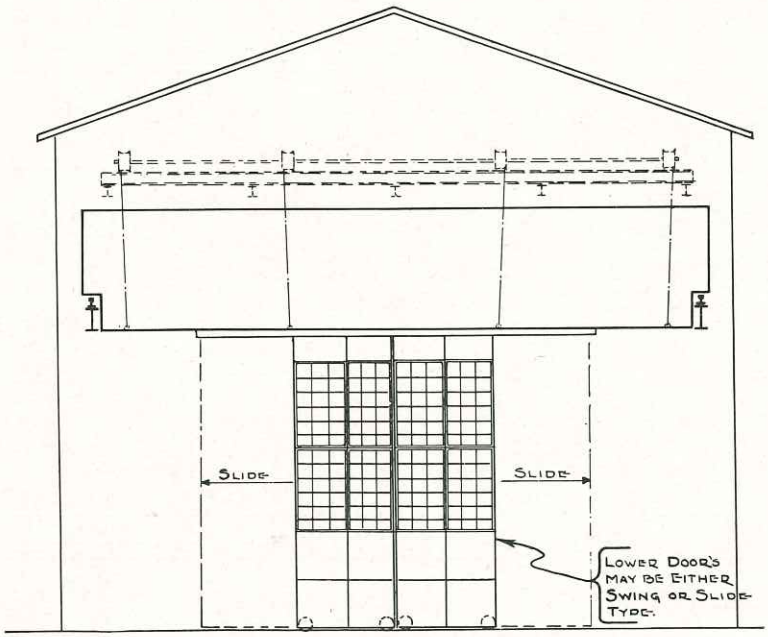


A good dependable crane door is an asset to any plant having a craneway running from the interior of the building to an outside storage yard. Frequently, the cost of a door of this type can be saved in a single season due to the increased efficiency of the workmen in the building and the conservation of heat in winter time. The door leaf can be completely filled with sash when maximum provision for daylighting is desired.

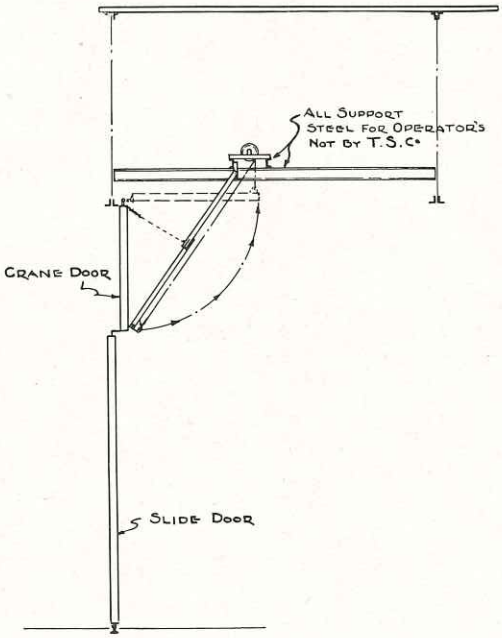
The door consists of a single large leaf hinged along its top to the bottom chord of the end truss. A system of knuckle braces holds the bottom of the leaf in its proper position when closed. The door is opened by a series of cables which collapse these knuckle braces and swing the leaf in and up to a horizontal position.

Each cable is wound on a drum which, in turn, is keyed to the main line shaft. The shaft, reducer, electric motor, limit switches and other mechanism is carried on framing between the bottom chords of the trusses.

These doors are designed to open and close quickly — the usual speed of operation being 45 feet per minute. They are weathertight and can withstand severe wind loads. All working mechanism is located inside the building and protected from the elements.



EXTERIOR ELEVATION



VERTICAL SECTION

TRUSCON INDUSTRIAL CANOPY STEEL DOORS

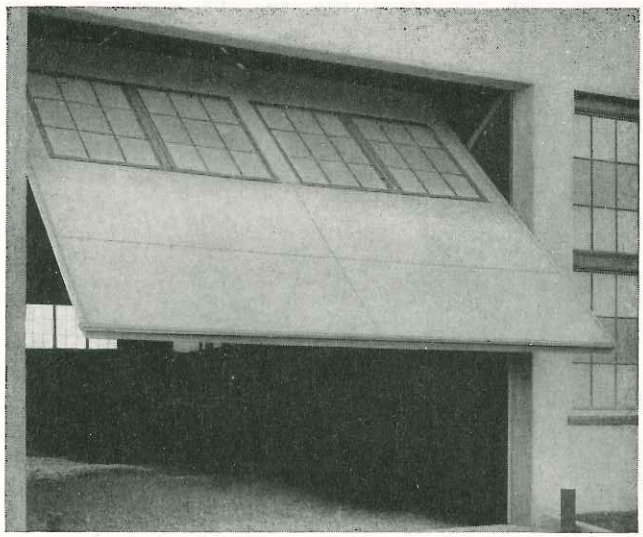
SERIES 800LT AND 800S

This type is an all purpose door. It fits in anywhere, from the small individual residence garage to largest openings required in locomotive roundhouses.

The Industrial Canopy Door is opened or closed by one of the simplest sets of operating hardware built for any door of its type. The hardware has been carefully designed and perfected through years of continuous manufacture and service. Very few moving parts are necessary and on these, ball bearings have been installed to reduce friction.

Operation of the small doors, Series 800LT, is by hand, while on the larger doors, Series 800S, mechanical power is furnished for hand chain operation. They are perfectly balanced at any degree of opening by the use of cast iron counterweights. If desired, an electrical operator will be furnished for any Industrial Canopy Door.

The weathering on either the Series 800LT or Series 800S is perfect. On both types it is steel at the head and both jambs, while at the bottom canvas insert rubber weathering is furnished.



Canopy Door—Door illustrated is 16′ x 14′

SPECIFICATIONS

Series 800LT

1. General — All doors shown on drawings and so marked shall be Industrial Canopy Steel Doors, Series 800LT, as manufactured by the Truscon Steel Company. No substitutions shall be made without the approval of the architect.

2. Material — The stiles, top rail and bottom rail shall be made from 1¾″ x 5″ 16 gauge Tube.

3. Construction — (a). All corners and intersections shall be welded and ground smooth. All welds must develop full strength of the section.

(b). The upper portion of the door leaf shall be fitted with steel windows of standard design. Glass shall be held in place with steel window putty and continuous steel glazing angles.

(c). The lower portion of the door leaf shall be fitted with steel panel.

4. Frames — The structural steel frame at both jambs and lintel (if required by building construction), shall be furnished by the contractor furnishing structural steel together with the necessary steel supports to support the door leaves and hardware.

5. Hardware — (a). The vertical travel of the door shall be controlled by steel guides, furnished by the door manufacturer. Rollers fastened to trunnions at both jambs shall operate in these guides and shall be placed so that the upper portion will balance the lower portion when the door is in an open position, forming a canopy over the opening. The swinging action of the leaf shall be controlled by heavy swing arms fastened near top of the door.

(b). Operation of doors, 100 sq. ft. and under in area (see note) shall be by hand, without the aid of a mechanical power. Doors over 100 sq. ft. in area shall be operated by means of a mechanical power.

NOTE: Series 800LT Doors, 100 sq. ft. and under in area are ordinarily furnished without mechanical power, but the addition of excess weight, such as heavy gauge steel and heavy glass, in some instances makes it necessary for a mechanical power to be used.

(c). Doors shall be perfectly balanced at all points by the use of cast iron counterweights.

6. Painting — All doors shall receive one coat of gray metallic primer paint before shipment.

7. Erection — The erection of doors shall be performed by the door manufacturer.

SPECIFICATIONS

Series 800S

1. General — All doors shown on drawings and so marked shall be Industrial Canopy Doors, Series 800S, as manufactured by the Truscon Steel Company. No substitutions shall be made without the approval of the architect.

2. Material — The stiles and rails shall be made from hot rolled structural shapes.

3. Construction — (a). All corners and intersections shall be welded solidly and ground smooth. All welds must develop the full strength of the section.

(b). The upper portion of the door leaf shall be fitted with steel windows of standard Truscon design, for inside putty glazing.

(c). The lower portion of the door leaf shall be fitted with steel panels made from roller leveled sheets, 13 gauge.

4. Frames — The door manufacturer shall furnish guides at the jambs for the vertical travel of the rollers. The structural steel frame at both jambs and lintel (if required by building construction), shall be furnished by the contractor furnishing structural steel together with the necessary steel supports to support the door leaves and hardware.

5. Hardware — (a). The vertical travel of the door shall be controlled by steel guides, furnished by the door manufacturer. Rollers fastened to trunnions at both jambs shall operate in these guides and shall be placed so that the upper portion will balance the lower portion when the door is in an open position, forming a canopy over the opening. The swinging action of the leaf shall be controlled by heavy swing arms fastened near top of the door.

(b). Operation shall be by mechanical power operated by hand chain.

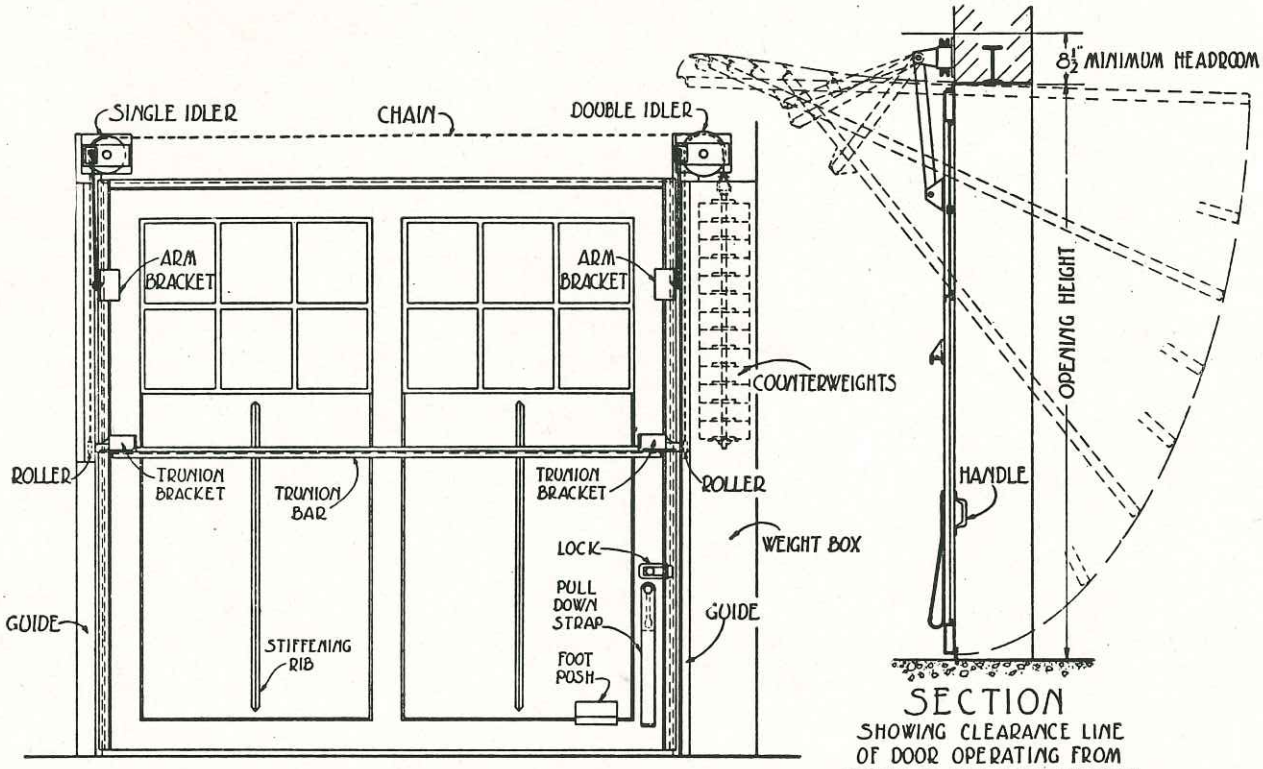
(c). Doors shall be perfectly balanced at all points by the use of cast iron counterweights.

6. Painting — All doors shall receive one coat of gray metallic primer paint before shipment.

7. Erection — The erection of doors shall be performed by the door manufacturer.

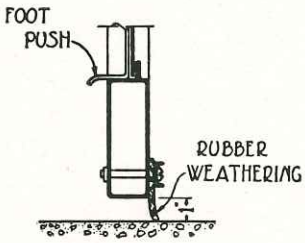
TRUSCON INDUSTRIAL CANOPY STEEL DOORS

SERIES 800LT—DETAILS OF TUBULAR CONSTRUCTION

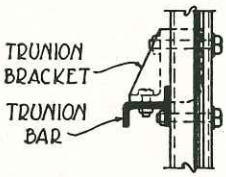


INTERIOR ELEVATION

SECTION
SHOWING CLEARANCE LINE OF DOOR OPERATING FROM CLOSED TO FULL OPEN POSITION



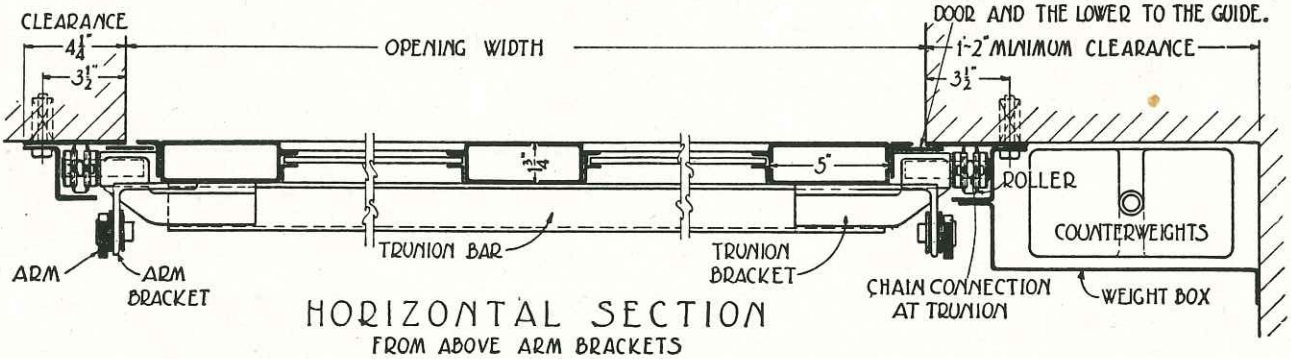
SILL



SECTION THRU TRUNION BAR

HEAD

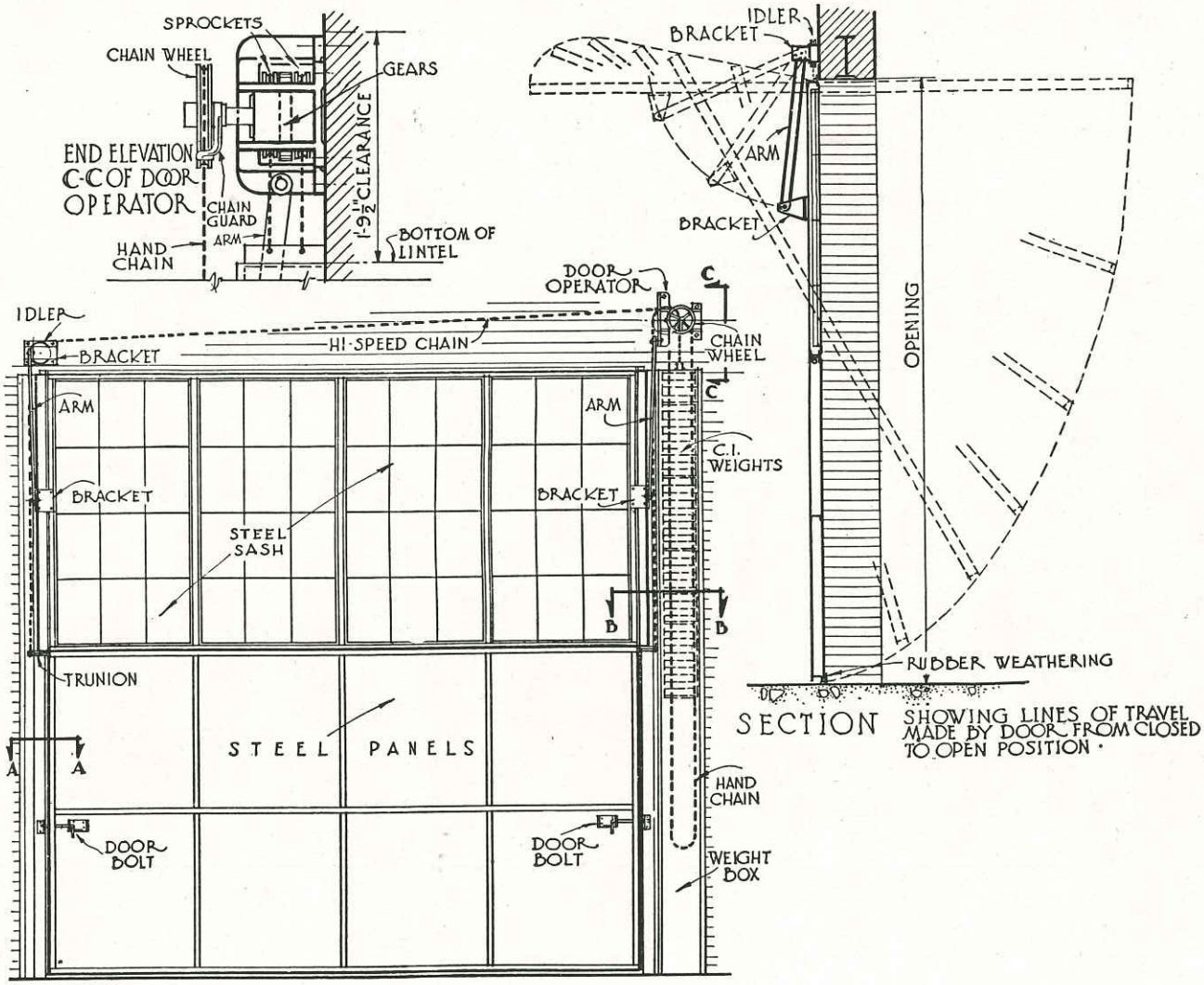
THIS JAMB PLATE IS DIVIDED IN TWO PARTS AT THE TRUNION, THE UPPER PORTION BEING WELDED TO THE DOOR AND THE LOWER TO THE GUIDE.

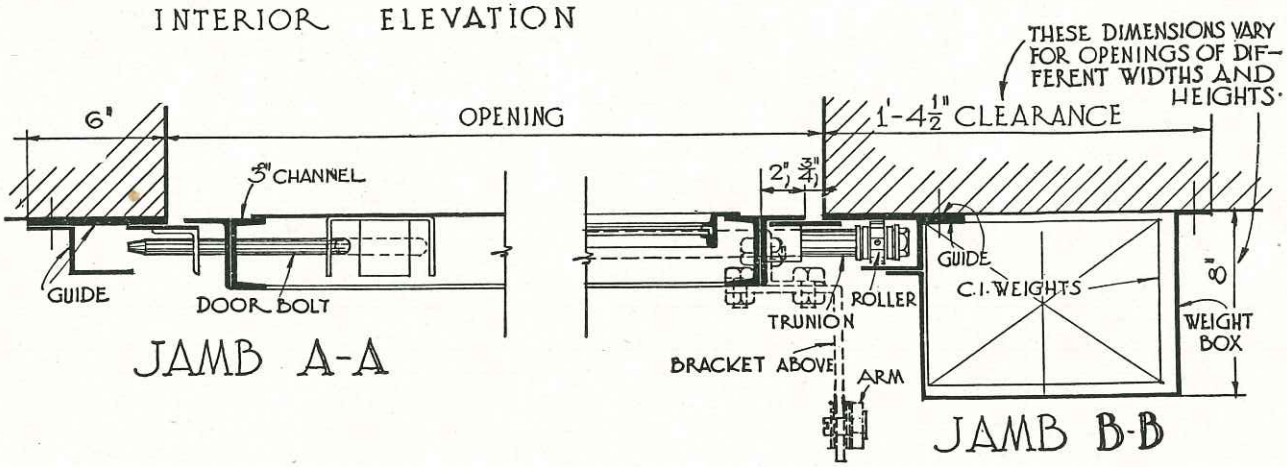


HORIZONTAL SECTION
FROM ABOVE ARM BRACKETS

TRUSCON INDUSTRIAL CANOPY STEEL DOORS

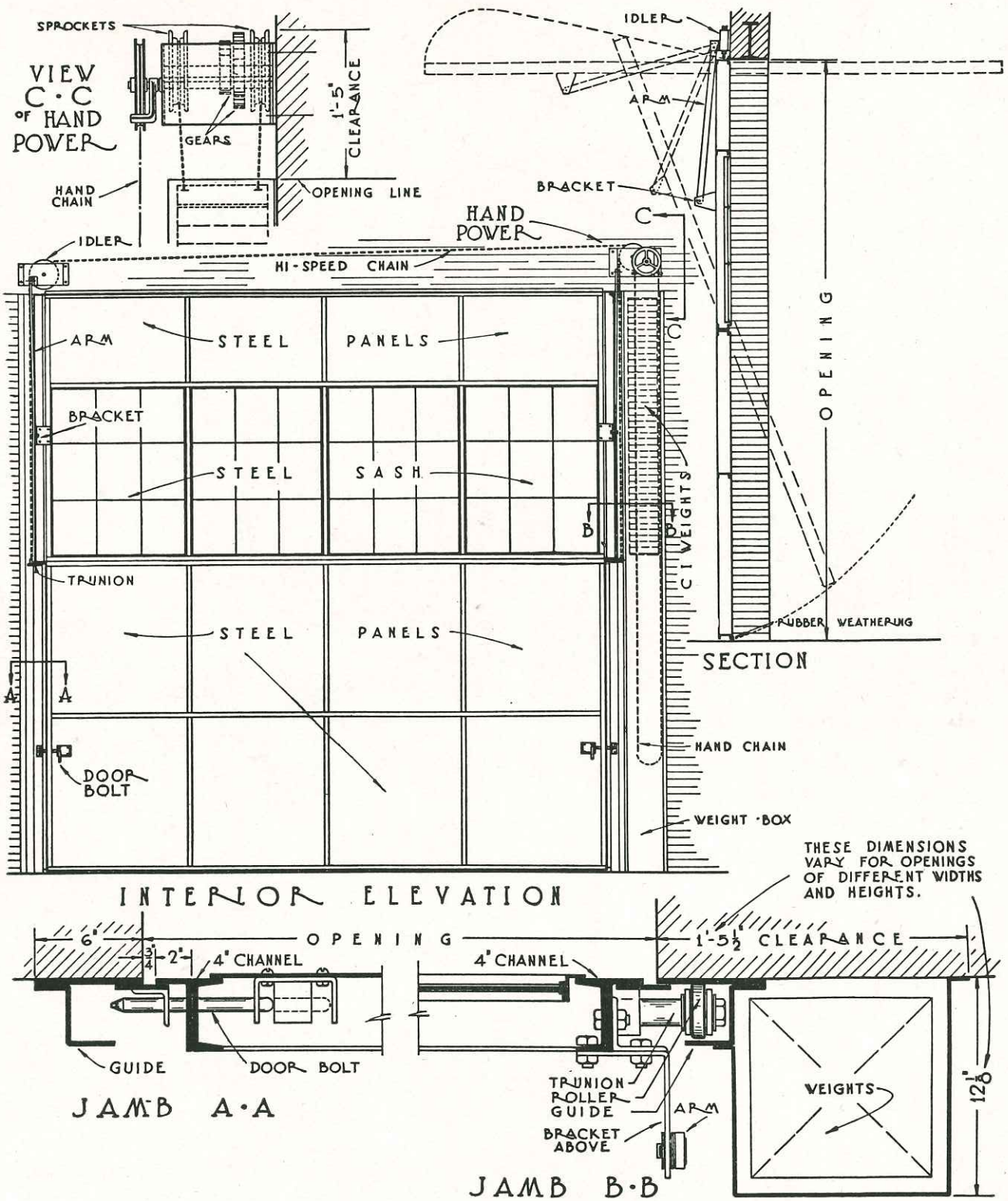
SERIES 800S—DETAILS OF 3″ CHANNEL CONSTRUCTION



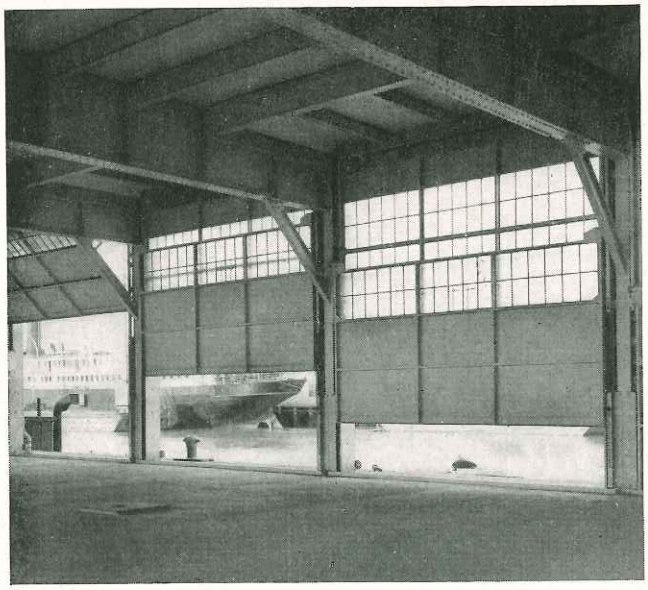


TRUSCON INDUSTRIAL CANOPY STEEL DOORS

SERIES 800S—DETAILS OF 4″ CHANNEL CONSTRUCTION



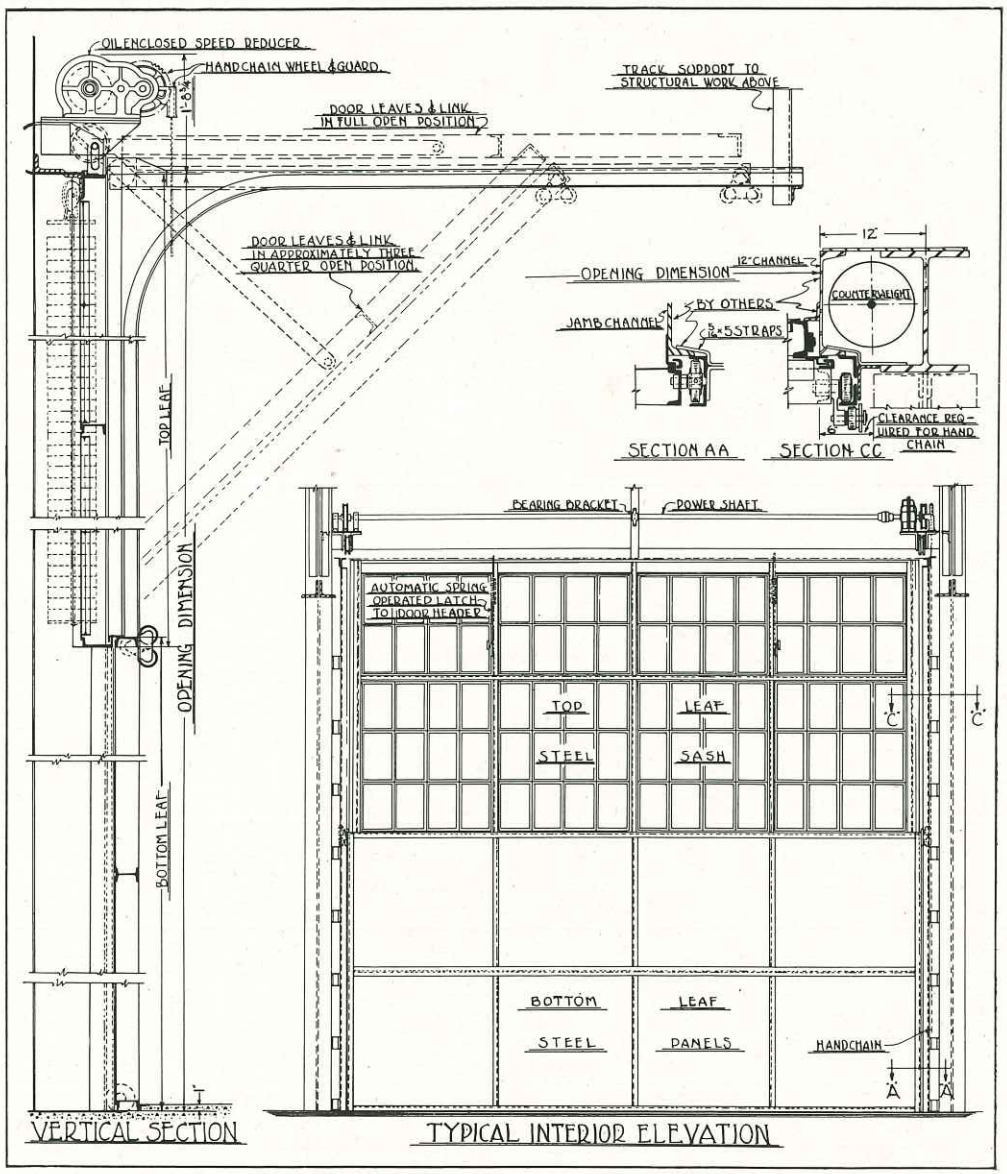
TRUSCON STEEL PIER DOORS—TURNOVER TYPE



These doors are characterized by unusually heavy construction. They are furnished in two types, in both of which the two leaves, when fully opened, lie in a horizontal position completely inside the building and behind the door header. The heavy leaves are perfectly counterweighted in any operating position, permitting the door to be easily opened and closed by hand.

Of the two types of pier doors available, each has its own advantages. In the Turnover Type, the bottom leaf slides vertically upward until it lies parallel to and behind the top leaf. Both leaves then move together, turning over, so that their outside surfaces are upward when they reach their horizontal position.

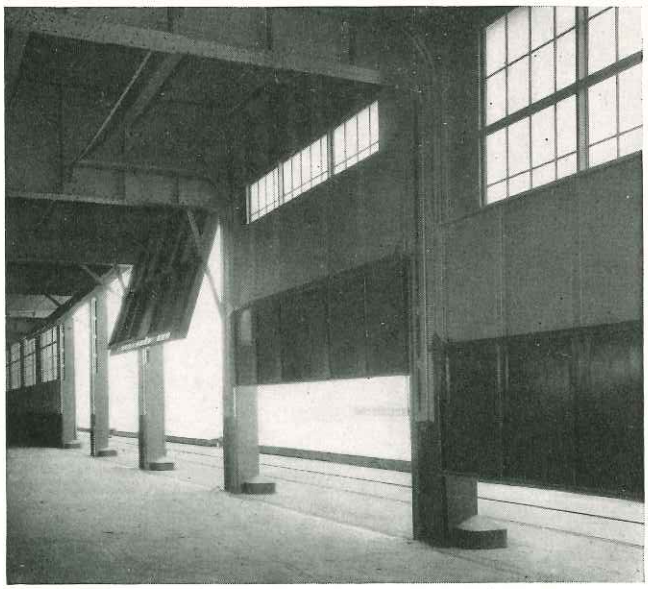
The principal feature of the two section turnover door is the reduced clearance, on the inside of the building, required for the complete opening or closing movement. Of particular advantage in doors of low height, the Turnover Design permits the piling of cargo to practically full height close to the door.

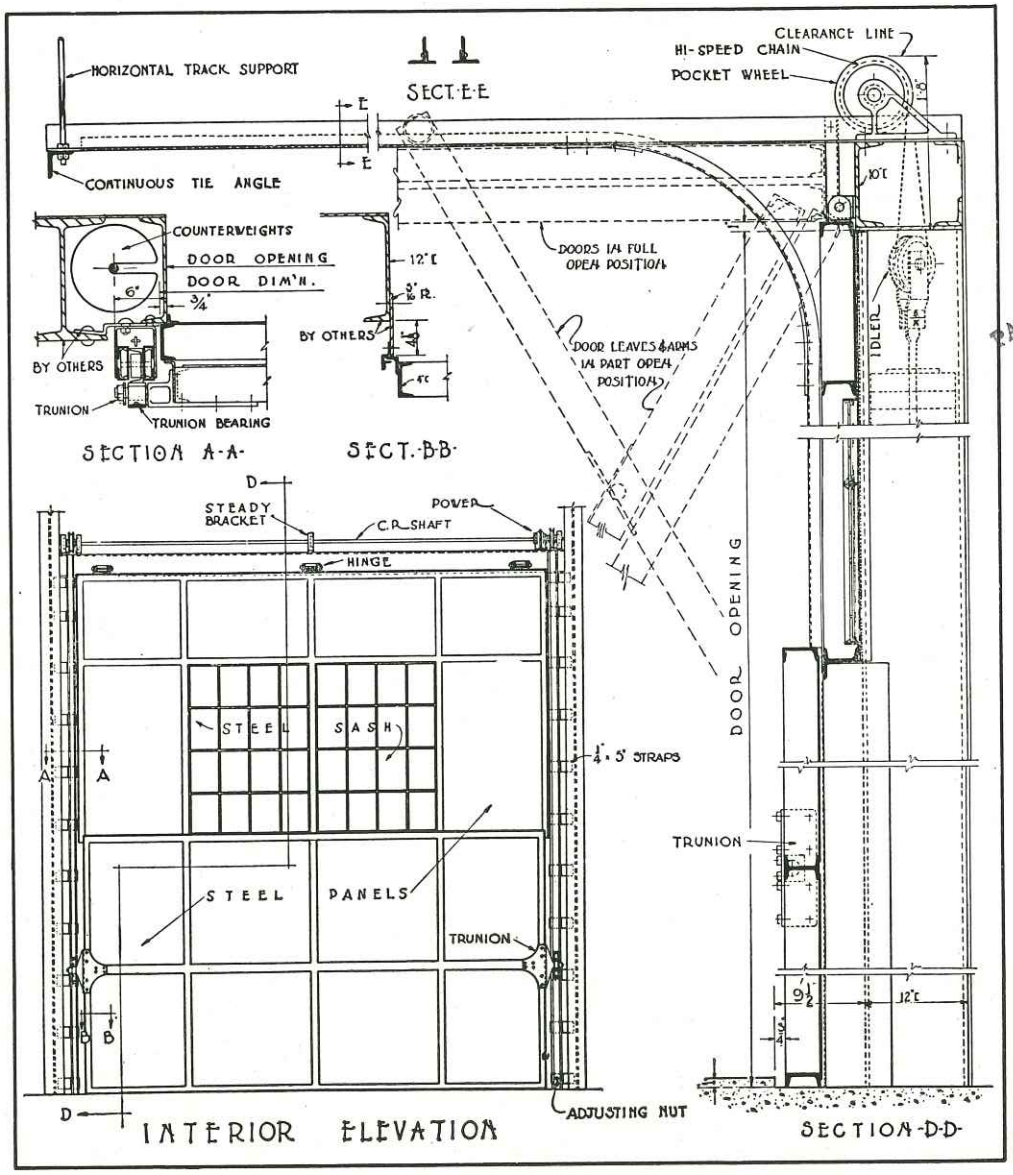


TRUSCON STEEL PIER DOORS—LIFT-SWING TYPE

The Lift-Swing Design differs from the Turnover Door in that the top leaf is hinged to the lintel at the top of the opening. After the bottom leaf has raised vertically to a position parallel to and immediately behind the upper leaf, both leaves swing in and upward to a horizontal position. The door is counterbalanced in all its operating positions by a unique system of arms and tracks at both jambs of the opening.

An important feature of the operation of a Lift-Swing Door is that it employs no spring locks or catches to control the sequence of operation of the leaves. This is simply accomplished by the movement of the arms in their tracks, making the vertical movement of the bottom leaf flow smoothly into the swinging movement of the top leaf. When this movement is reversed, it provides a positive closing of the top leaf against the strongest winds. This smooth operation is particularly desirable for motor-operated doors and because of this desirable feature, the Lift-Swing Doors are also widely used for warehouses, bus garages, and similar structures.





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CLEVELAND 15, OHIO, 735 Hanna Building Annex
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JACKSONVILLE 2, FLA., 301 Hildebrandt Building
KANSAS CITY 6, MO., 1001 Fluor Building
LITTLE ROCK, ARK., 812-13 Union Life Building
LOS ANGELES 54, CALIF., P.O. Box 3699, Terminal Annex Station
LOUISVILLE 2, KY., 477 Starks Building
MEMPHIS 5, TENN., 269 Walnut Street
MINNEAPOLIS 2, MINN., 246 Baker Building
NEW ORLEANS 12, LA., 1143 Canal Bank Building
NEW YORK 17, N. Y., 155 E. 44th Street
NORFOLK 10, VA., 518 Dickson Building
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OMAHA 2, NEB., 806-07 Insurance Building
PHILADELPHIA 3, PA., 1616 Walnut Street
PHOENIX, ARIZ., 303 Luhrs Building
PITTSBURGH 22, PA., 2541 Oliver Building
PORTLAND 12, ORE., 2139 N. Kerby Avenue
RICHMOND, VA., 122 N. 8th Street
ST. LOUIS 3, MO., 8th Floor, Shell Building
SALT LAKE CITY 10, UTAH, 1526 So. West Temple Street
SAN FRANCISCO 5, CALIF., 604 Mission Street
SEATTLE 4, WASH., 757 Central Building
SYRACUSE 3, N. Y., 303 Syracuse-Kemper Insurance Building
TOLEDO 4, OHIO, 220 Richardson Building
WASHINGTON 5, D. C., 700 Investment Building
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RETURN TO DESK

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